SCIENTIFIC AMERICAN

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. XXXVIII.—No. 7. [NEW SERIES.] NEW YORK, FEBRUARY 16, 1878. [$3.20 per Annum. [POSTAGE PREPAID.]

THE CASH RECORDING MACHINE.

We illustrate herewith a new machine for making people honest—a consummation to which (if it ever can be attained by machinery) no small amount of inventive genius is just now being brought to bear. Hitherto most efforts have been directed to the mechanical shoring up of the consciences of car conductors and stage drivers; but the present inventors have advanced higher, and propose to apply the same salutary influence to the moral sense of every class of employee within whose duties the handling and disbursing of cash is included. It must have occurred to any one who has noticed the Babel of confusion which exists in any large city retail drygoods store, for example, when crowded with shoppers, and when a constant stream of cash boys circulates between clerks and cashiers, that scarcely any system of checks and records depending upon the memory and fidelity of the employees can exist which does not leave loopholes for fraud. We are not prepared to assert that the present machine will at once substitute a system in which it is impossible to swindle, because it is a lamentable fact that there is perhaps nearly as much ingenuity enlisted in the service of sin as in that of virtue, and somebody may discover how to "beat" even the most thoughtfully contrived mechanism; but the new "cash recorder" certainly offers a very simple mode of keeping forcibly accurate records, and, for our part, we fail to see where the chance to defraud it exists.

It is not necessary to describe the mechanism in detail, for such would necessitate a number of drawings for which the space is not at our disposal, and it will be sufficient, in fact, for all interested, to know simply what the machine does. On the ledge in front of the apparatus there is a series of buttons, B, and on the side is a series of levers with buttons on the ends, which we denote by C. In the top is an opening through which can be seen numbers—in the engraving these indicate $81.65. In front is a handle, A. By pulling this the figures seen through the slot are caused to disappear, leaving only blank metal surfaces in view. Suppose, for instance, a customer pays in the amount above noted, $81.65. On receiving this the cashier presses the second button on the left of series B, and then the button marked $ in series C. The dollar mark then appears in the position shown through the platform slot. The third button of series B is then pressed, and the button marked 8 in series C, which causes 8 to appear in the slot, and this operation is repeated until the desired sum is indicated. The cashier next inserts a piece of paper in the space D, and grasping the two handles shown, brings the movable one, E, toward the stationary one. This so operates a stamp that on the blank paper is imprinted the sum to which the machine has been set, besides the date and signature receipt of the firm. These last are previously adjusted. The paper must be returned to the salesman, and constitutes his receipt for the money forwarded by him, or it may be given directly to the customer in lieu of a receipted bill.

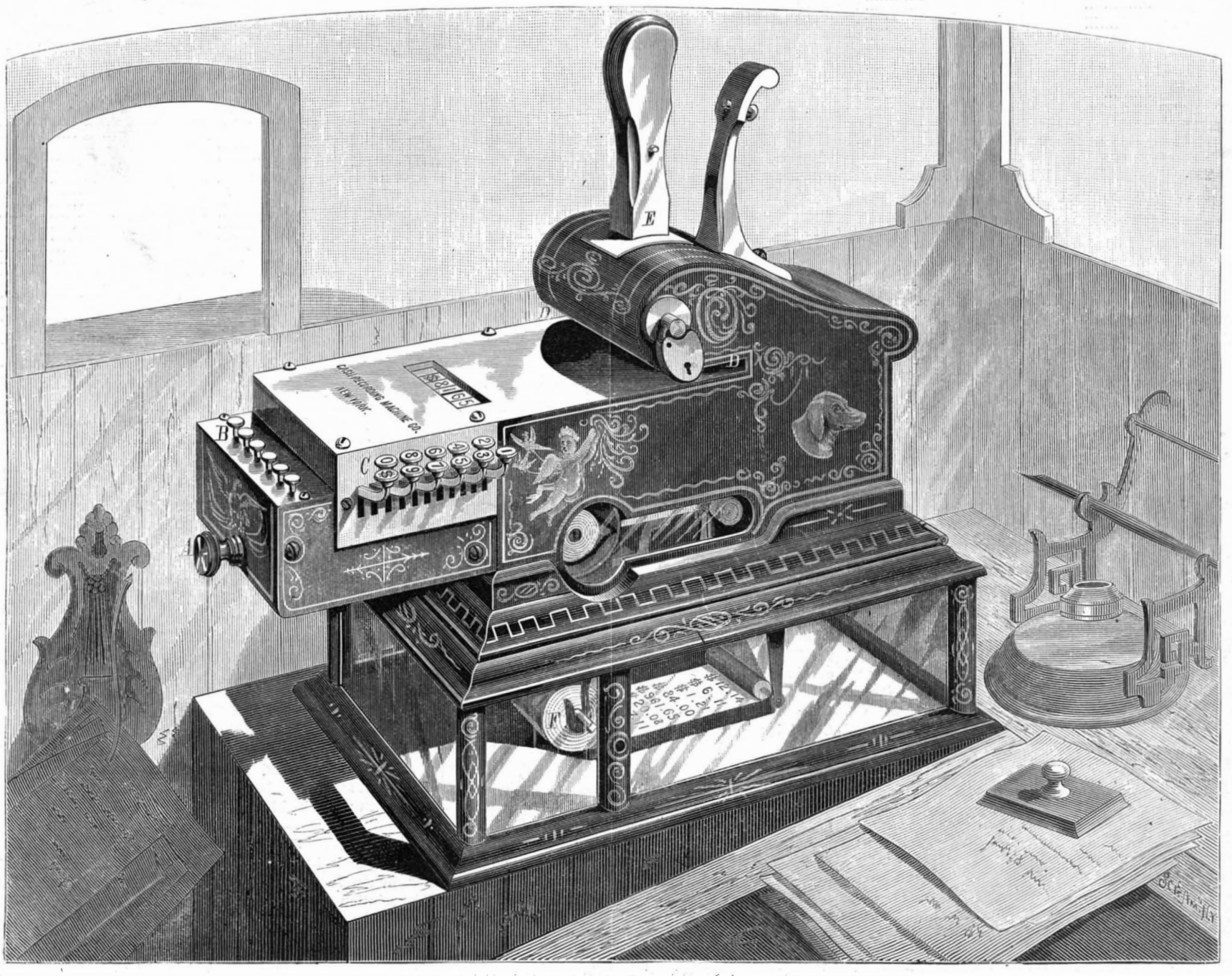
Underneath the apparatus, and inclosed in the casing, is shown a roll or strip of paper, F. On this, at the same time the receipt is printed, an impression of the figures is also made. This side of the box, only by removing which access can be had to the interior, is locked in place, and consequently the cashier cannot tamper with either the mechanism or this printed slip, which thus becomes a record of all moneys received and registered. At the close of the day's business the proprietor opens the box, removes the slip, and adds up the figures thereon. The sum must tally with the amount of cash in the cashier's possession, and if it does not there is proof that he has not done his duty in making proper record. If the printed receipts are delivered to salesmen, these can be tallied also with the cash on hand.

The machine is equally applicable to disbursements of money, especially in the purchase of grain, produce, the payment of wages, etc. It is small, strong, and compact, measuring a little over a foot in length by four inches wide and less than a foot high. It is placed upon a glass stand, which acts as a receptacle for the paper upon which each transaction can be seen as it is charged against the operator. Apparently after very slight practice the figures can be manipulated with a rapidity equal to that accomplished by the use of a pen, while the receipt, date, and signature are completed much quicker than by hand.

The manufacturers have applied for space in the Paris Exposition, where the machine will be exhibited, adapted to the English and various continental currencies. The device is manufactured by the Cash Recording Machine Company, at 21 Sycamore street, Buffalo, N. Y. Inquiries may be addressed to the office of the company, 148 Worth street, New York city.

A Curious Fire.

A few days ago, in one of the most careful households in this city, where fenders guard the fireplaces and safety matches aggravate the strange visitor, smoke was discovered in a room adjoining the one where the family were at breakfast. Investigation showed that a chair in the room was burning. How it could have taken fire was a mystery, until it was noticed that the sun's rays, falling on a large magnifying lens used to study photographs with, had been concentrated through it upon the chair, and had set it burning. If the family had not fortunately selected for breakfasting an hour when the sun is pretty near the zenith, and so prudently fixed it to have some one in the room at that dangerous time, the whole house might have been mysteriously destroyed.—*Hartford (Conn.) Courant.*



THE CASH RECORDING MACHINE.

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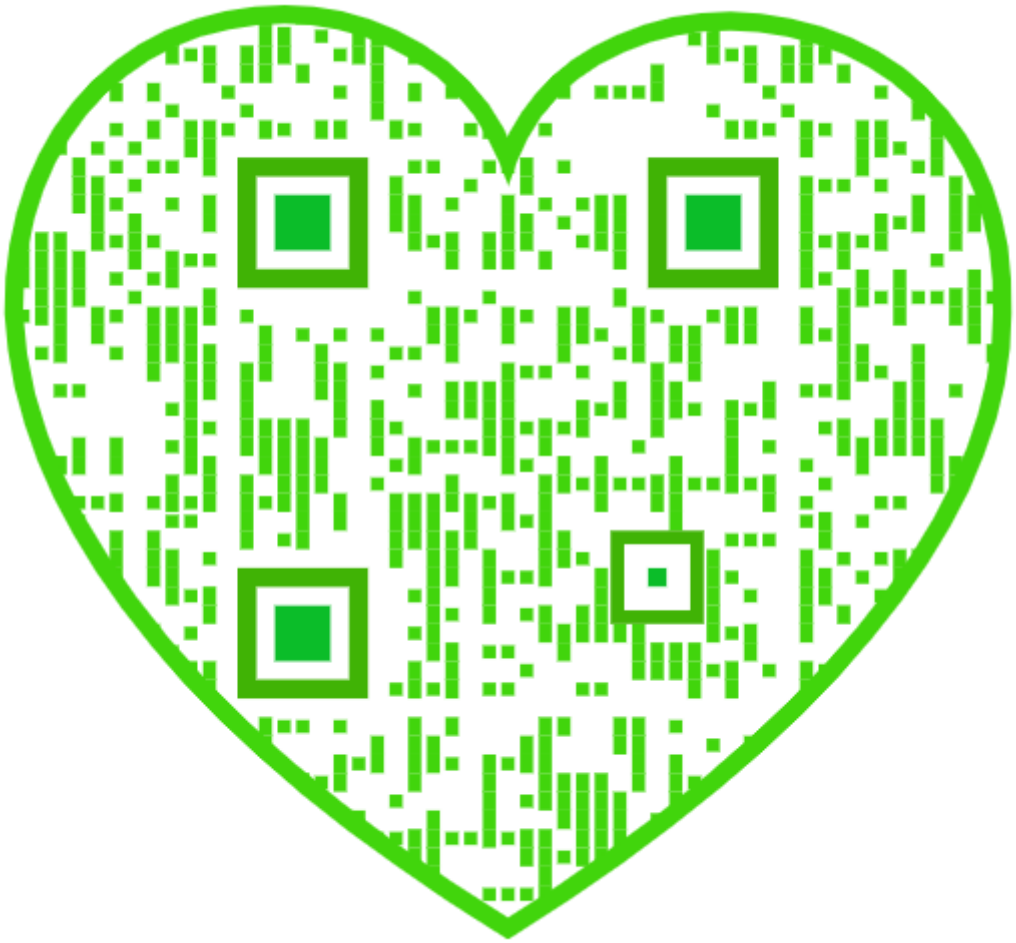

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT
NO. 37 PARK ROW, NEW YORK.

O. D. MUNN. A. E. BEACH.

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VOL. XXXVIII., No. 7. [NEW SERIES.] *Thirty-third Year.*

NEW YORK, SATURDAY, FEBRUARY 16, 1878.

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Simultaneous Transmission in Opposite Directions. By M. GIOVANNI MARINI. 1 illustration.—Electric Currents of High Tension. By M. GASTON PLANTE. Interesting Experiments, and 7 illustrations.—Battery in which the Electrode Attacked is of Charcoal or Coke. By M. JABLOCKKOFF.—The Telephone.—Modification of Bell's Telephone. By M. TROUVE.—New Single Liquid Battery.—Action of Light upon Oxalic Acid.

VI. MEDICINE AND HYGIENE.—On Rotary-lateral Curvature of the Spine. By Professor LEWIS A. SAYRE. Lecture delivered at Bellevue Hospital, N. Y. Self-suspension, and the Latest and Best Practice and its beneficial Results as illustrated by several cases.—Chancre of the Lip. Was it communicated by a Dentist's Instruments? By C. W. DULLES, M.D.

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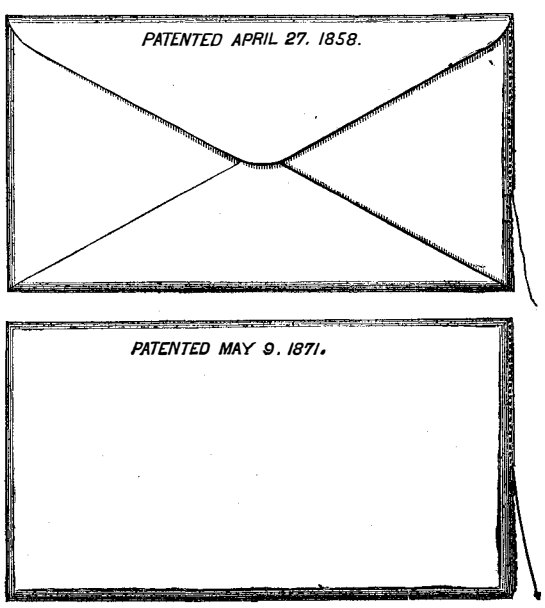
A PATENT OFFICE COURT.

The Commissioner of Patents recommends, in his report, that the present system of appeals be abolished, and that "a Patent Court be established in connection with the office, to be composed of three members, appointed as other judges of the United States Courts now are." The Commissioner says that this tribunal would relieve him of his judicial duties and establish uniform precedents.

The idea of a court sitting to discover whether a party shall have a standing in court—and this would be the character of the proposed establishment—certainly possesses the charm of novelty; but it assumes a more important and reassuring aspect when it is remembered that the grave and weighty questions which so often threaten the average examiner with premature baldness may by this plan be subjected to the learned judicial mind *in banc*. Perhaps, armed with microscopes, their Honors will be able to demonstrate to lower orders of intelligence the hidden principle which underlies the granting of patents on infinitesimal distinctions, as exemplified in the envelope-opener case illustrated herewith. In 1858 Mr. Charles Phelps obtained a patent for a letter-opener, consisting of a thread placed in a crease of the envelope, as shown in the upper figure of our engraving. In 1871 Mr. Henry Gregg obtained a patent for a letter-opener, consisting of a thread placed in a crease of the envelope, as shown in the lower figure of our engraving. In either case, to open the envelope you pull the thread so as to make it cut the paper. Unwary intelligence, ignorant of the profundity with which the Patent Office burrows into these subjects, would rashly assert that here was no difference; but the lynx-eyed genius of that institution pityingly points to a knot in the thread, to be found on our lower figure by the aid of a magnifying glass, and triumphantly issues a patent on that. Single minds cannot constantly be subjected to such stress, and a court is the obvious remedy.



Nothing short of a bench of gown-clad judges learned in the law can consistently grapple with such claims as that of Mr. Joseph A. Griffin, of Syracuse, N.Y., who, on December 7, 1875, patented the "compound as a substitute for eggs." What, for instance, are such simple legal questions as are involved in contingent remainders, the "rule in Shelley's case," and *cestui qui* trusts, beside the consideration of "ten parts cream tartar, three parts tartaric acid, one part alum, nine parts bicarbonate of soda," besides additions of "curcuma, sulphur, sugar, gum arabic, and starch?" It must be clear that nothing but the longest practice in digesting law can fit any one for digesting "plain cake" composed of the above appalling ingredients mixed with butter, etc., and baked in a quick oven. Better is the agony of three judges with dyspepsia than that one patent for delusive eggs should be improperly issued.

Then there is the great army of inventors of woman-power baby rockers, combined hair crimpers and hog scratchers, and excelsior mouse traps. Every one of them is prepared to assert that his particular invention is the discovery of the age, and probably inwardly believes that nothing short of a tribunal of archangels is really competent to pronounce upon it. Shall these men be denied the poor substitute of a bench of human judges who will investigate the scratchers and baby rockers by the light of the back numbers of the Patent Office *Gazette*, the common law, and the Revised Statutes? Certainly not. Let us have that court, and at the same time any other complications which will obstruct and muddle the business of the office and provide more expensive and useless officials for the inventors to pay for.

None more than ourselves applaud the well-meant efforts of Commissioner Spear in the direction of useful reform; but he can readily inform himself of the fact that the great majority of applications for patents are based on very simple devices, and that it is rarely that one is so obscure as to be beyond the intelligence of any well versed mechanic. This being the case, there certainly is, or ought to be, ample ability among the members of the examining corps to meet all questions which may come before them, and consequently a new Patent Court is as unnecessary as it is objectionable.

THE ANNUAL REPORT OF THE COMMISSIONER OF PATENTS.

From the above document, which has just been sent to Congress, we find that the amount of moneys received during the year from all sources was $732,342.85. The expenditures were $610,475.12, which is less than any year since 1871, notwithstanding the expenses incurred during the fire. The receipts exceeded the expenditures by $121,867.73, which, added to the present surplus to the credit of the Patent Office in the U. S. Treasury, leaves a total balance of $1,114,222.40.

The following shows the business of the office for 1877:

Applications for patents and designs.....	20,308
Patents and designs issued	13,619
Applications for reissues	639
Patents reissued.....	568
Patents extended.....	2
Caveats filed	2,809
Patents allowed, but not issued for want of final fee	807
Application for trademark registration ...	1,416
Trademarks registered	1,216
Applications for registering labels.....	632
Labels registered.....	392

The Commissioner states that the photo-lithographing of the back issues of the old patents is still going on, and it is hoped that by the end of next March the tracing of the entire number of old drawings will be completed, ready for the photo-lithographers. In connection with this he suggests that the specifications of the back numbers of patents should also be printed, and asks for $20,000 for a commencement of this important work, which is very much needed.

There is a falling off in the business done by the office as compared with some previous years, but this the Commissioner attributes to the fact that the increased facilities which the office by its publications has afforded the public for examination into the state of the various arts have affected and will continue to affect to a great extent the number and character of applications as well as of patents. A less number of applications covering old fields of invention will be filed, and a corresponding improvement will be found in the character of patents granted.

This is undoubtedly true, and is excellent evidence of the double advantage of publishing complete illustrated descriptions of all patents obtained as widely and at as cheap a price as possible. They spread valuable information among the public, and enable inventors to keep posted, both as to the most recent advances in invention and also as to the tendency of inventive genius, for, as we have pointed out before, invention runs in grooves, and there appear to be times when the world is ripe for certain original ideas, and these often simultaneously appear from different sources. The recent simultaneous discovery of the possibility of liquefying the so-called permanent gases by two investigators is another remarkable example in point of the workings of this possible law of invention.

The following table shows the number of patents issued to each State and Territory during the year:

Alabama.....	43	Montana Ter.....	3
Arizona Ter.....	2	Nebraska.....	36
Arkansas.....	36	Nevada.....	24
California.....	341	New Hampshire	78
Colorado	28	New Jersey.....	502
Connecticut	607	New Mexico Ter	3
Dakota Ter.....	6	New York.....	2,496
Delaware	28	North Carolina.....	51
District of Columbia	123	Ohio.....	1,083
Florida	14	Oregon	38
Georgia.....	63	Pennsylvania.....	1,515
Idaho Ter.	1	Rhode Island.....	212
Illinois.....	1,046	South Carolina.....	34
Indiana.....	450	Tennessee.....	114
Iowa.....	488	Texas.....	115
Kansas.....	103	Utah Ter.....	4
Kentucky.....	151	Vermont	58
Louisiana.....	79	Virginia.....	100
Maine	132	Washington Ter.....	4
Maryland	192	West Virginia.....	81
Massachusetts.....	1,392	Wisconsin.....	245
Michigan.....	383	Wyoming	9
Minnesota.....	146	United States Army.....	14
Mississippi	39	United States Navy.....	2
Missouri.....	365		
Total.....			13,029
Foreign.....			590
Total.....			13,619

In the matter of ratio of inventors to population Connecticut leads, the proportion being 1 in 885; this in any other State or Territory does not exceed 1 in 1,000. The Commissioner proposes another change in which we are cordially in agreement with him, namely, the dispensing with models in applications except in special cases—"where the capability of the machine to operate is called in question, or where the examiner is in doubt as to the sufficiency of the drawing, or where models may be necessary for ready illustration on appeals or in interference cases." This change, if carried out, will, as the Commissioner states, relieve the inventor of a large part of the expense attending applications for patents. The Commissioner has only in this case to issue an order that hereafter models will not be required except in such special instances where they may seem necessary, as indicated above. No new legislation is necessary. The Commissioner has nothing but precedent, which is not obligatory, to set aside, as under the law applicants are to furnish models when "required by the Commissioner."

Indestructible Writing Ink.

An ink that cannot be erased even with acids is obtained by the following receipt: To good gall ink add a strong solution of fine soluble Prussian blue in distilled water This addition makes the ink, which was previously proof against alkalies, equally proof against acids, and forms a writing fluid which cannot be erased without destruction of the paper. The ink writes greenish blue, but afterward turns black.—*Pharmacist.*

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TELEGRAPHING WITHOUT WIRES.

Some recent experiments by Professor Loomis, which will be adverted to presently, recall to our mind some of the interesting ones made years ago, serving to re-awaken interest in a matter that, although well known, had not received the attention it deserved, owing to the rapidity with which one discovery in electricity was following in the wake of another. We refer to the almost constant traversing of telegraph wires by earth currents. One of the experiments to which we refer was made by M. Bouchette on the left bank of the Rapt-de-Mad, a small stream in the Department of the Moselle. Putting to the earth the two ends of a wire 1,100 feet long, he sent through it the current from a battery of two Bunsen cells. On the right bank a line of equal length, having a galvanometer in circuit, was also put to the earth at its two ends. When the battery circuit was closed the needle of the galvanometer was thrown violently against one of its stops; when the current was reversed the needle flew around to the other. This showed clearly that the current which traversed the galvanometer circuit depended entirely upon that from the battery, yet the two circuits were separated by a distance of 300 feet, including the intervening stream.

The subject was taken up a little later by M. Bourbouze, who has obtained some very important results. He demonstrated the existence of earth currents by connecting a delicate galvanometer with the gas and water main of his laboratory. He varied his experiments by connecting the galvanometer with a body of water and with a metallic plate buried in the ground. In one of his researches it occurred to him to put one pole of a battery to the earth and to connect the other with a body of water. On pressing down his key, the galvanometer of the former circuit was at once deflected, and remained permanently so. The battery current was interrupted, the needle returned to zero; the current was reversed, the needle swung round in the opposite direction. It is evident that in order to obtain good results the earth currents must be neutralized, as they tend to increase or diminish the deflection. This is easily done. When the balance is obtained the existence of any other current, however transient, is at once detected.

The first experiments of M. Bourbouze were made near the Pont d'Austerlitz, Paris. One of the wires was connected with the earth and the Seine. A battery consisting of 600 cells (copper sulphate) was placed near the Pont Napoleon, one pole being to earth and the other connected with copper plates immersed in the Seine. Care having been taken to adjust the galvanometer in the former circuit, it was found that when the current was made the needle was deflected 25° and even 30°. The same experiments were repeated at Pont St. Michel, near St. Denis, with like results.

The possibility, therefore, of transmitting signals to distant points without the use of wires would seem to be conclusive; and whatever doubts may have existed on the subject will be dispelled by the success that has recently attended the investigations of Professor Loomis, of Yale College. His experiments were made in the mountainous regions of West Virginia, between lofty peaks. For his purposes he used kites, a copper wire being substituted for the usual kite string. The kites were raised to a considerable height, when it was found that signals sent along one wire were transmitted by aerial currents to the second, ten miles distant. It was also discovered that continuous aerial currents exist at this altitude capable of serving the purposes of the telegraph, except when interrupted by violent atmospheric disturbances.

COLOR-BLINDNESS IN ITS RELATIONS TO THE SAFETY OF THE TRAVELING PUBLIC.

It is not very reassuring, in view of the possibility of serious accidents on the sea or on railroads through the failure of pilots and enginemen to note danger signals, to read—as the result of a most careful scrutiny—that five per cent. of the population of Germany, England, France, Sweden, and probably also of other countries, are color blind; and that, moreover, such persons develop to a wonderful degree the power of acquiring terms of color as well as normal-sighted people by the aid of external signs, and up to a certain point are very clever at concealing this defect. This matter is considered of great importance, and has received much attention in Europe. On one of the great French railroads it has been the practice since 1855 to examine candidates for employment in regard to their power to distinguish colors. As this practice of the company was well known, it is presumable that those who sought situations were unaware of any visual defect; and for this reason the result of the examinations must be considered surprising, for the proportion of those found to be color blind was ten per cent!

Dr. Stilling, of Cassell, has just published a valuable set of charts for the use of railways and shipping companies in testing the color perceptions of those in their service. These are an improvement on a former set issued by him, but based on the same principle. They are so far based on the complementary idea, which is of the more consequence, as is well set forth by the author, that complete color blindness is rare. The cases otherwise run into two groups, marked off by the relations of the primary colors. The man who is red blind is also green blind; the man who is blue blind is also yellow blind. The red of the spectrum appears to the red-green-blind people as dark yellow; green up to a certain limit in the spectrum appears as pale yellow, and beyond that limit blue. The violet of the spectrum appears to them dark blue. There is on the part of many of this class an entire blindness for red light as light, and not only want of sensibility for the color red. Dr. Stilling's tables are skillfully printed in small squares or figures of different colors, and the candidate is asked to count the number of these squares from point to point. If color blind he will be unable to do so. This is a very interesting subject, and its investigation in our own country might possibly set at rest the question as to the cause of many a collision of the past, both on land and water.

THE ELECTRIC LIGHT IN PHOTOGRAPHY.

It often happens that photographers are restricted and hampered in their work by want of suitable light; that is, a steady and uniformly diffused one, in which the actinic rays are in their proper proportion. This occurs chiefly in work conducted under conditions unfavorable to the use of the natural light of the sun, as for instance in cloudy weather or at certain hours of daylight. Sometimes, too, it is desirable to obtain a photographic representation of places partially or wholly inaccessible to sunlight, as in mining excavations or in the interior of peculiarly constructed buildings; and not infrequently the darkest hours of the night are the ones in which the delineation, if practicable, would be the most serviceable. Many suggestions and experiments have been made to obviate this difficulty. The magnesium light, the lime light, and the electric light have been employed in various ways, but without giving complete success, the main objection in each case being that the rays are, with the ordinary methods, too strongly concentrated, thus producing pictures in which the lights and shades are not only too sharply marked, but also too local, the effect of the blinding glare being also decidedly unfavorable to the expression of the unfortunate sitters called upon to face it. Before us is a photographic portrait taken in London by what is known as the Van Der Weyde light. The sitting was had at midnight, a fact which by no means appears in the result. The photograph is more than up to the average standard of excellence, combining a well-defined sharpness of outline with a uniform diffusion of light and shade. Mr. Van Der Weyde, an artist, formerly of New York, after two years of experiment, has succeeded in producing a successful adaptation of the electric light to photography. The light employed is produced by a dynamo-electric machine, with the usual carbon points. The sitter is screened from the direct rays, and receives only those from a parabolic reflector. The rays are made convergent, uniform (and consequently soft and pleasant) by means of a Fresnel lens, which throws an evenly distributed beam over a sufficient space to include the subject. It seems reasonable to believe that the new process is something more than a mere hint, and that it might be successfully applied, with suitable modifications, to all parallel branches of the art.

"THAT IS NEAR ENOUGH."

When we see a piece of work laid down with the remark "That's near enough," we know at once that it is not a first-class job. The employer may say "that's near enough" because he has taken the work at a price that he cannot afford to do good work at, or it may be a temporary repair in which time is of more consequence than first-class workmanship. If a workman makes use of the remark we know that he has little pride in the job, and is satisfied to do inferior work; while if an apprentice says "that's near enough," we conclude that he is not likely to make any reputation as an expert or good workman.

Suppose a professor of mathematics were to say twice $2\frac{1}{2}$ are 4; it might be near enough for the purpose to which he applied it, but it would not be near enough to maintain, much less to stake, his reputation as a mathematician upon.

The difference in time necessary to convert the quality of a job from that denoted by "that's near enough" into that expressed by "that is a first-class job" may be sufficiently worthy of consideration in many cases; but the confidence, expertness, experience, and interest in one's work the latter gives and leads to, represent the best spent time an apprentice or workman can possibly employ, because such practice soon enables him to turn out first-class work in the same time formerly required to finish the job in a "that's near enough" style, and therefore converts him from an inferior or ordinary into a superior workman.

"That's near enough" has led to hundreds of so-called accidents, which have come down to us as mysteries. It makes hot bearings, throws shafting out of line, causes nuts to come loose, bolts to fall out, shafts to break, brings in the plumber to disturb the peace of our homes, leads to scamping, to botch work, and finally to ruin.

When the hands can lay down a piece of work and say "that's near enough," the spirit of emulation has gone; the very expression is a confession of indifference as to quality without an equivalent or gain as to quantity.

DANGEROUS SMOKE AND DRINK.

Several physicians of this city have united in pointing out the dangers incident to the smoking of cigarettes, which practice is now becoming much more prevalent than it has been at any former time. Where a few years ago there was but a single brand of cigarettes—the Cuban—there are now 358 different kinds in the market, some composed of tobacco of varying degrees of vileness, descending down to stuff little better than dirty refuse.

It is stated that not one fiftieth as much of the mucous surface of the body is covered by cigar smoke as by the inhaled smoke of a cigarette; that in persons of nervous temperament cigarette smoking produces constitutional effects, and is prolific of vertigo, dimness of vision, dyspepsia, and bronchial diseases. Old pipes are known to be directly poisonous, and we published not long ago the formidable list of deleterious chemicals which are taken into the system when cigars are smoked. In the present instance the reader might reperuse that list and add to it pyrogallic and pyroligneous acids from the paper envelope of the cigarette, besides the fumes of the decayed paste with which that envelope is fastened.

Adulterated or rather miserable imitations of wines and liquors are also becoming very common. Recently an establishment in this city was seized by the sheriff, and a well known druggist was requested to analyze the compounds sold under the name of wine. The results are interesting. Here, for instance, is port wine concocted of new cider, cherry brandy, alum, spirits, alkanet root, and tartaric acid. Cherry brandy, of spirit, sugar, and oil of bitter almonds, the last probably from coal tar. Out of 45 gallons of so-called old bourbon whisky, 40 gallons were alcohol flavored with saltpeter and fusel oil. The concoctions are bad enough, but the expert thought that they were not so injurious as pure liquor, an opinion with which most people, we imagine, will hardly agree.

THE SHOP CLOCK.

The shop clock is not usually classified as a special tool, but it performs special services which no other tool in the shop can perform. It furnishes the data to make up the amount for each man's envelope on Saturday night. It reproves the tardy workman who, as he enters the shop where the other men are busy at work, glances hastily at its face and looks anxiously around to see if his entrance is observed by proprietor, superintendent, or foreman. He feels under the clock's surveillance until his coat is taken off and his tools are in his hands, and if still unobserved he feels that he has cheated the clock.

When a face anxiously seeks the shop clock every hour or so, the thoughts are usually anywhere but upon the work, the hands are unwilling and the employer is not getting justice. When the hands of the clock mark five minutes before the time for ceasing work we may find the unscrupulous workman washing his hands with his employer's benzine or machine oil, or leaving his work to heat water to wash in. The lazy workman is waiting because "it is no use to begin a new job five minutes before quitting time." The workman anxious to be anywhere save at work, is maneuvering to get near the shop door, ready to make a bolt when the clock strikes. When the clock does strike the quitting hour the careful workman puts away his tools or finishes some little detail that will take but a moment if done at once, but would occupy much more time if not at once finished. While some of these careless workmen have laid down their tools just where they happened to stand when the clock struck, others may have departed leaving their machines running, with the prospect of a smash up if they are not on hand in the morning when the machinery starts; and others still may have left their gas jets burning. If clocks could talk it would be a great boon to foremen.

THE BULLION PRODUCT OF 1877.

From Wells, Fargo & Co.'s annual statement of precious metals produced in the States and Territories west of the Missouri river, including British Columbia and the west coast of Mexico, during 1877, we learn that the aggregate yield was $98,421,754, being an excess of $7,546,581 over that of 1876, which was the greatest previous annual yield in the history of the country. Arizona, Colorado, Idaho, Nevada, New Mexico, Oregon, Utah, and Washington show an increase, while there is a decrease in British Columbia, California, Mexico, and Montana; although it is possible that the falling off in Montana is more apparent than real. If the Comstock mines yield as much in 1878 as during the past year, the aggregate product of *gold* and *silver* will approximate $100,000,000.

The gross yield for 1877, stated above, segregated, is in round numbers as follows: Lead, 5 per cent, $5,085,250; silver, 48 per cent, $47,206,957; gold, 47 per cent, $46,129,547. Lead being an important element in what is termed *base bullion*, we might add that of Missouri and Illinois, with an approximate value of $1,500,000; this, with the silver and gold of the Lake Superior region, Virginia, and North and South Carolina, amounting to, say, $500,000, would swell the gross product to over $100,000,000 for the year. The exports this year are the greatest known, namely, $105,000,000 up to the 26th of December, the greatest amount in former years having been that of 1857, $83,650,000.

The Color of Mars.

A ludicrous scene recently took place at the Royal Astronomical Society following the reading of Mr. Green's paper on the planet Mars, when a foolish person present started the theory that the red color of Mars was due to heat or rust. The President caused much amusement by announcing with much gravity that the lateness of the hour would unfortunately prevent a discussion of the point in question. The theorist appeared to be the only person present who was insensible to the joke.

A New Trade.

As a result of the Turkish war a business has opened in human jaws, which are collected in Bulgaria and consigned in large quantities to Paris. The lower jaws are selected, and their value depends upon the soundness, regularity, and whiteness of the teeth, which are extracted on their arrival and used for dental purposes.

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NEW ADJUSTABLE SWIVEL HANGER.

Hangers with rigid bearings having their boxes made in one piece with the hanger have been extensively used for supporting shafting, but the difficulties that occurred in fastening them to beams some distance from each other, and getting them nicely adjusted so as to be in line, have occasioned the substitution of hangers with swivel and adjustable bearings, and these are now generally preferred to all others.

Among the requirements for hangers are the following: They should be of such a form as to be rigid and free from vibration; the foot should be broad, presenting a large area to admit of being securely and readily bolted to beams by bolts of good diameter; the bearings or boxes should be lined with the best metal, and be made in proportion to the lengths and diameter of shafting; the boxes should be adjustable, as their correct adjustment is a matter of economy, utility, and great importance; in connection with the bearings there

SWIVEL HANGER—Fig. 1.

should be ample provision made for oiling and drippings; the adjusting devices should be of the simplest and still of the most reliable and efficient character. The hangers represented here fill these requirements, as may be readily seen by an examination of the engravings. The metal of the body is well distributed and put in strong form. The foot is broad, allowing for bolts of large diameter. The boxes are readily adjusted by upper and lower screws, and are capable of being moved vertically or laterally, swinging from a fixed center; they are also readily oiled, and the drip cups are easily removed for emptying and cleaning.

Fig. 1 shows the swivel hanger without and Fig. 2 with an arm for a belt shifter. The proportion of the length of the boxes is four times the diameter of the shaft, and they are lined with good metal. This hanger was patented November 13, 1877, by Messrs. First & Pryibil, the extensive manufacturers of wood working machinery, whose machine works are at the corner of West Fortieth street and Tenth avenue, in this city. They have designed this hanger more especially for the export trade, aiming at neatness, strength, and ready adjustment, and we think they have succeeded in attaining these features.

Gold and Silver in the Andes.

An interesting dispatch has been forwarded by Mr. Gibbs, our minister to Peru, to the Department of State relative to the gold and silver production in Peru, from which we condense the following: Peru had up to last year no regular code of mining laws, but the Congress of that country has recently passed a law aiming to counteract the evils of the old system, under which mines could be held indefinitely, although under merely nominal working, there being over 15,000 mines in Peru, of which, however, only about 600 are actually worked. The legal rate between silver and gold was formerly 15½ to 1, but gold was demonetized in 1872, and silver is no longer in circulation owing to the suspension of specie payments. In 1876 gold ranged at 90 per cent premium and silver at 56. There is but little silver coin in Peru at present, although much plate, comprising common bedroom utensils, is still owned by families in the interior and in the large towns. During the past ten years $36,000,000 worth of silver has passed through the Lima mint for coinage or assay, the amount coined being $17,000,000. Gold coin pays 3 per cent export duty. The exportation of national silver coin is prohibited, but silver bars may be exported on payment of 3 per cent and coin is accordingly melted into bars to evade the prohibition. There is but a slight production of gold, but silver is largely produced and exported either as metal or ores. Coinage is unlimited and gratis, the mint receiving bullion and returning its value in coin. Silver is found in all the western range of the Andes from latitude 3 degrees to 22 degrees south. The district of Cerro del Pasco produced, between 1630 and 1849, $475,000,000. A tunnel on the plan of the famous Sutro Tunnel is projected at Cerro del Pasco, 150 feet below the present workings, and is calculated to open up 100,000 square yards of surface and $500,000,000 worth of fresh ore. This is but one of the many mining districts, as others of equal value with better railroad facilities exist in the province of Puno. Before the modern system of railways the difficulties to be encountered in the way of smelting silver were incredible, the ores being transported great distances on mules' backs over rugged mountain paths, where often animals with their loads were lost through a misstep, yet, notwithstanding this, immense quantities were smelted at the government works. There is an immense but fluctuating export trade in ore and bullion from Peru to England. In 1875 coin to the value of $2,735,000 was exported, and in August, September, and October of 1876, $2,024,920.

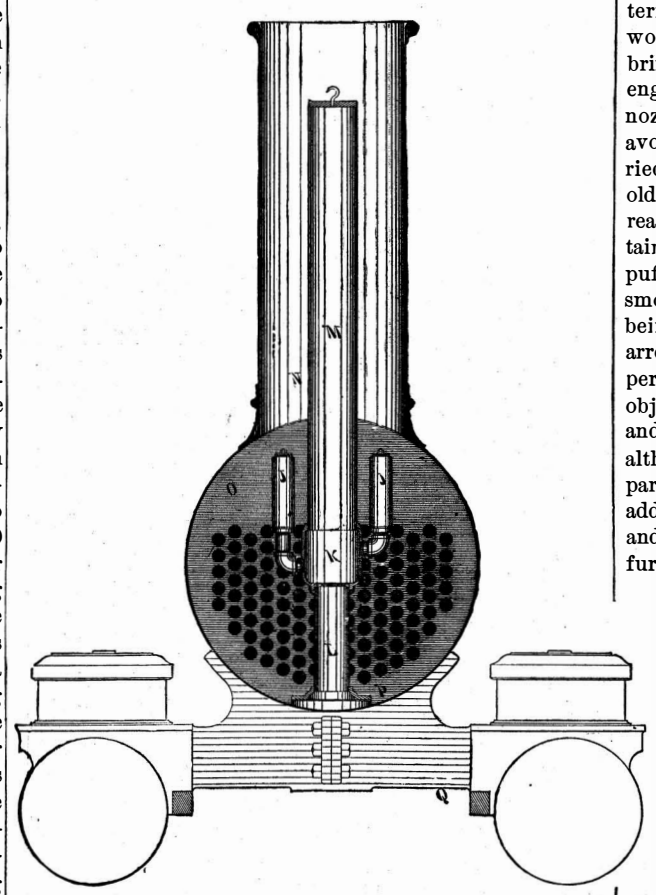
SHAW'S IMPROVED EXHAUST NOZZLE.

The annexed engraving represents an exhaust nozzle, invented by Thomas Shaw, of 915 Ridge avenue, Philadelphia, Pa., which has for some time past been successfully applied to locomotives, high pressure stationary, and marine steam engines. The engraving shows its application to a locomotive. It will be seen from this that the stack is straight and of a diameter larger than is usual. This form of nozzle is used where the maximum quieting effect is desired; the steam cushion chamber, M, extends up the stack, N, and the large exhaust pipe, L, connects with the expanding chamber, K, from which branch off eight or ten spiral exhaust nozzles, J, the number being regulated by size of engine.

The violence of the exhaust from the engine is entirely subdued, the draught is excellent and less variable. This description of exhaust nozzle can be applied to all heavy engines working in cities and towns where noise from the exhaust steam and sparks from the furnace are objectionable.

The inventor, who is a practical engineer, claims that this nozzle equalizes the draught, giving a higher average, with a lower maximum draught, and permits the use of stacks of large diameters. The importance of this can be better realized when it is considered that the average velocity of gases passing out the average stack (14 inches in diameter) is 113·7 feet per second, or 77·5 miles per hour, equaling a pressure of 30 lbs. per square foot, which force is competent to elevate and eject out of the stack a two-inch cube of granite, and the maximum force is far in excess of this amount. Whereas, in forcing the same amount of gas out of a stack double the diameter, the velocity will be reduced to 28·4 feet per second, or less than 20 miles per hour, with a force of only 1·8 lbs. per square foot. Here is an example in which, by the increase of the area of stack of only four times, a decrease of sixteen times in the force of the blast is obtained, without in any way interfering with the draught.

The advantages claimed for this improvement are stated by master mechanics and captains of steamboats and steamships to be very important. For instance, by this quiet manner of exhausting, frightening horses is prevented; locomotives can enter the center of cities and towns, without being a nuisance; the screens frequently placed on locomotive stacks are not needed, neither are the extension pipes required within the smoke arch; a powerful draught is obtained without the ejection of small coal and dust from the stack; the engines can be reversed without drawing cinders into the cylinders; no brick work is required in the smoke arch; the noise that accompanies the escape of steam from boilers and exhaust pipes in launches, tugs, ferryboats, river or ocean steamers, is prevented.



SHAW'S IMPROVED EXHAUST NOZZLE.

On an experimental run with express engine No. 49, P., W. & B. R. R., having an exhaust nozzle of this description, the economy effected by its use was satisfactorily proved. On this occasion the Shaw nozzle was run with an 18 inch straight stack, without screens or extension pipes. Cylinders of engine were 16 inches diameter by 22 inches stroke; driving wheels 66 inches diameter; maximum steam pressure, 120 lbs.; area of outlet of the Shaw exhaust, 16 square inches; diameter of old exhaust nozzle (which was a double nozzle), 3¼ inches, or a working area of 12 square inches. The coal used was ordinary bituminous. Engine 49 is known as one of the most economical engines on the road, and the engineer in charge of same has a good reputation for careful running, and is extremely economical in the burning of coal. The trial was intended to be a severe one for the new nozzle, on account of previous trials having shown a larger saving than was thought possible, and it was believed that no additional saving could be effected on that engine, her average consumption having been from 58 to 59 miles per ton of coal, but on this run, with the old nozzle, she beat her former record and made 61 8-100 miles per ton, which was accomplished by careful firing and management. The result of trial shows that the engine, with the old nozzle, consumed 3,000 lbs. more coal and ½ cord more wood in a run of 1,176 miles—notwithstanding the fact that the engine, with the new nozzle, pulled 3 additional passenger cars 96 miles and made 5 additional stops, and pulled express car 60 miles with brakes on, equal to at least 3 additional cars, (during which time she was compelled to make up 46 minutes lost at the ferry), over a moist and frosty track, at a time

SWIVEL HANGER—Fig. 2.

when the leaves were falling, causing great slipping of engine drivers and an amount of piston travel and consequent consumption of steam and fuel, so that the miles traveled over do not give sufficient record of amount of work done.

But notwithstanding these unfavorable circumstances, the engine, with the new nozzle, pulled a heavier average train 66¼ miles per net ton of coal, with a saving of 3,000 lbs. of coal and ½ cord of wood in a run of 1,176 miles. The estimated saving on the above engine amounts to $585 per annum, running only 96 miles per day. During run with new nozzle an average of 3½ barrels of fine coke was removed from the receiver, in front end, per trip, or 42 barrels during trial. This same fine coke is thrown out with the old nozzle to the injury of passengers and damage to the company. This fine coke is not estimated in the above saving. The estimated weight of this material is 200 lbs. per barrel, or 8,400 lbs. during trial. The accumulation of this material on 70 engines would be 8,929 tons per annum, and it would furnish a combustible for forge fires, and should bring not less than $2 per ton, which would net, on said 70 engines, $17,858 per annum. During the run with new nozzle all risk of drawing cinders into the cylinders is avoided, and a shallow fire of 6 or 8 inches deep is now carried, without any risk of tearing holes in the fires as in the old nozzle, which requires a depth of 15 to 18 inches. By reason of the shallow fires a more perfect combustion is obtained; very little smoke is evolved, which exhibits itself in puffs as each shovelful is thrown in. The long trail of black smoke is now converted into a cloud of steam, the smoke being decreased fully ten-fold. The new nozzle does not arrest wood sparks, but it arrests 3½ barrels of coal sparks per 96 miles run, without any screens whatever. All the objectionable noise of the ordinary exhaust was obviated and quieted down to less than one fourth of the old exhaust, although no attention was paid or adjustment made in this particular, as it formed no part of this experiment. The additional comfort afforded passengers by having less smoke and cinders cannot be estimated in dollars and cents. For further information address the patentee.

Anthropology.

Dr. E. Lambert, of Brussels, has made a careful study of the teeth in the various races of man, and has arrived at some interesting conclusions. He finds very distinct characteristics in the dentation of the white and black races, especially in the molar teeth, for while in the former race they decrease in size backward, the last or wisdom tooth being the smallest, it is the reverse with the black race, the last being the largest.

Again, in the white race the molars have usually four cusps; in the black race the more usual number is five.

He observes also in the black race a slight diastema not met with in the white, and with the former the inner tubercle of the premolar is less developed than the outer, as with the anthropoid apes.

The dentation of the yellow races is more closely allied to the white than to the black race.

The red or native American race was unexpectedly found to present very nearly the same dentary characteristics as are shown in the black race.

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APPLIANCES FOR SUPPORTING LIFE IN IRRESPIRABLE MEDIA.

In 1853 the Belgian Academy of Sciences offered a prize for the best appliances which should enable the miner to penetrate at once, and to a great distance, into a pit filled with choke-damp; to remain there several hours; to carry his lamp with him without danger; and to retain the free use of his arms. Of the competing apparatus sent in, the Galibert, Fayol, and Denayrouze aërophores were the principal ones which survived the test of actual experience.

The Galibert respirator consists of an air-tight reservoir of waterproof cloth, carried on the back like a knapsack,

Figs. 1 and 2.—Rouquayrol's Respirator.—Front and Rear.

from which the wearer draws his air supply, and into which he exhales the products of respiration. The limited supply of air and danger of injuring the reservoir rendered this plan of little use. The original apparatus of M. Fayol was very similar; but the respired air was ejected through a valve opening upward. A small tube also led the air supply to a lamp. This respirator lasted about fifteen minutes. An improvement was introduced in connecting several respirators, by flexible tubes, with a central reservoir, into which air was forced by a pump. In this form the Fayol respirator has been used with success, but the complication of flexible tubes forms a great obstacle to its extended application.

In 1875, the apparatus invented by M. Rouquayrol, and improved by M. Denayrouze, of Paris, was awarded the Montyon prize of 2,500 francs. Considerable improvements have since been made on the plan, as the following description and cuts (taken from *Iron*) will best explain:

The respirator, shown at Figs. 1 and 2, consists of a tube, light, strong, and flexible, terminating in a mouthpiece held between the teeth, while a flange of suitable shape is adjusted between the lips and gums for keeping it in place. The tube passes across the back of the wearer, being held by a belt and cross strap; while fitting in the hollow of the back is the valve box, shown enlarged at Figs. 3 and 4, the latter being partly in section. The valve box is of metal, and is provided with two reed valves; they consist of two flat sheets of India-rubber, stuck together at the edges, so as to remain closed until the internal pressure exceeds the external. These valves are arranged to open in opposite directions; that in the interior of the box permits the outer air from the tube to enter the box, while the other allows the respired air to escape at the proper moment. On account of

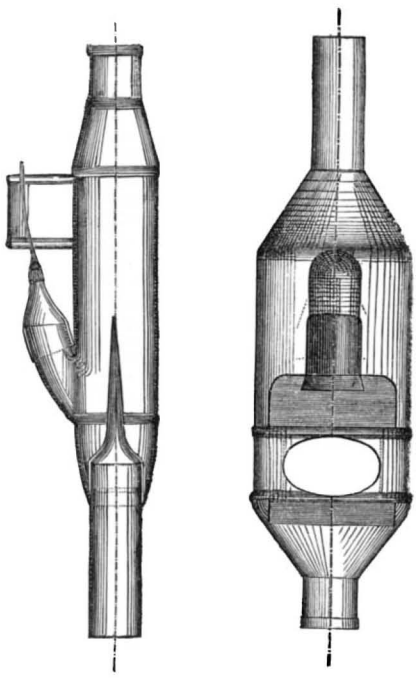

Fig. 3.—Valve Box of Rouquayrol's Apparatus. Fig. 4.—Valve Box, Enlarged and in Section.

the nature of these valves, the slightest excess of pressure between the two elastic leaves causes them to separate and yield passage to the air, so that breathing is effected with the greatest facility. The nostrils are closed by the mask, shown separately at Fig. 5, which combines the goggles for protecting the eyes with a nose clip. The latter consists of a pad made of double India-rubber cloth, the space between being inflated with air, so as to form a soft cushion, which adapts itself to the face. In this respirator the outer end of the tube is simply put in communication with the outer air; but for distances greater than 100 feet respiration becomes difficult, and a pump or pair of bellows must be brought into requisition for giving the air supply.

Another high pressure aërophore, shown in use at Fig. 6, is composed of three stout cylindrical chambers of sheet steel connected together and carried on the back like a knapsack. The apparatus, filled with air compressed to 30 atmospheres, affords a supply capable of lasting half an hour. The air, after passing through an ingeniously designed

Fig. 7.—Schultz's Aërophore.

regulating valve, which enables the wearer to breathe with perfect ease, is conveyed to the mouth by a tube terminating in a flange inserted between the lips and teeth, while the exhaled air is discharged through the reed valve at the side. There are two smaller tubes, one in connection with a safety-lamp, and the other connected with a pressure gauge for showing how far the air supply is becoming exhausted.

The aërophore devised by Herr Schultz, captain of the fire brigade at Aschaffenburg, Bavaria, depends upon the regeneration of the exhaled air, the oxygen being produced as it is consumed. It consists of a simple reservoir of sheet iron, into which the products of respiration are returned. The respired air is led from the mouth by a flexible pipe to a cylindrical tube containing a layer of wadding to intercept dust; and pieces of pumice-stone saturated with caustic potash absorb the carbonic acid. This tube is in direct communication with the reservoir, as is also another tube on the other side containing pumice-stone saturated with dilute acetic acid and sprinkled with crystals of permanganate of potass. This latter is for replacing the oxygen absorbed in respiration, and for adding a certain amount of humidity to the air, which makes it fresher for breathing. Fig. 7 shows a German fireman provided with the apparatus. The flex-

Fig. 6.—High Pressure Aërophore.

ible tubes for inhalation and exhalation are connected to the bottom of the reservoir. The apparatus only weighs about 10 lbs., and may be used for half an hour together.

It is easy to foresee the possibilities of a further development of this principle. It may be instrumental in saving life not only on the recurrence of mining accidents, such as occur almost weekly in the Pennsylvania mining districts, but when, for instance, a house is on fire, and it is impossible, on account of the smoke, to reach those whose means of escape is cut off, and who must in too many instances, as in the Hale pianoforte factory fire, be left to perish in the flames. In chemical works and breweries, also, persons overcome by mephitic gas might frequently be saved were there some simple and efficacious means for effecting a rescue without danger to the rescuer. If hung in bedrooms, it would save the inmates, who might not awake until the fire was far advanced.

Miscellaneous Notes.

PEROXIDE OF HYDROGEN is recommended to prevent the spread of scarlet fever and small-pox, as it contains a larger amount of oxygen than any other known substance, and one half of which is loosely combined and in a highly active condition, ready to combine with any organic matter with which it may be brought in contact.

It would seem, therefore, to be an agent specially suited for the destruction of the poison germs of scarlet fever, small-pox, and other epidemic diseases.

As a disinfectant it is recommended, and may be sprinkled over letters, papers, and articles of clothing, and may be combined with any perfume, preferably with toilet vinegar or eau de cologne, in the proportion of about a drachm to the ounce.

WHY THE MEDICAL PROFESSION IS CROWDED.—In the United States, with a population of 44,874,814, there are 62,383 doctors, being 1 doctor to every 600 persons. In France the population is 36,100,000; the physicians 19,902, being 1 doctor to every 1,814 persons. Great Britain, with a population of 32,412,010, has 19,385 doctors, or 1 physician to every 1,672 persons. In the German Empire there are 13,686 doctors for a population of 41,060,695—1 doctor to every 3,000. Austro-Hungarian Empire, population 35,904,435, and 14,361 doctors, being 1 physician to every 2,500 persons.

SIMPLE METHOD OF PREPARING STEREOPTICON SLIDES.—We are indebted to the Rev. W. H. Dallinger, of England, the well known microscopist, for a simple method by which a lecturer can prepare his own slides. Take a piece of glass of the proper size to suit your lantern, that is carefully

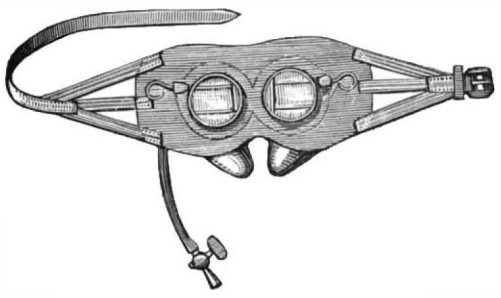

Fig. 5.—Rouquayrol's Apparatus.—The Mask.

ground on one side, like the focusing glass of a camera. Now place the glass with ground side up over a piece of white paper and make your sketch, or place it over the illustration in a book, or upon any drawing you wish to copy, and trace the outline, and afterward delicately shade with H.H. H.H. and H.H.H. pencils, and for deep shadows H.B. By delicate employment of the pencil, shadows softer than can be procured in lithography may be made.

Color can now be added, if necessary, cleanly and carefully over the shading. Thus one layer of color will suffice.

To make it a transparency, thin some good pale Canada balsam with benzine to about the consistency of cream, and simply float it over the ground surface of the glass. Pour off until the drop comes very sluggishly, then reverse so that the corner from which the balsam was flowing off be placed upward. Let the return flow reach about the middle; then reverse it again, and move it in several directions to get the balsam level. This may be done with a very little practice, so that the surface shall be undistinguishable from glass.

We have now a perfect transparency, and to complete keep the glass level for 24 hours for hardening, and then fasten another square of glass on to it by strips of paper at the edges, with small pieces of card at the corners to prevent contact, and you have an admirable lantern transparency. Microscopical drawings can thus be taken direct from the camera lucida, and the most complicated drawings easily prepared for the lecture-room and screen.

NATURALISTS residing in or near New York should take advantage of the immense variety of living forms of aquatic life to be met with at the New York Aquarium. Every facility is offered to students, and perfect courtesy may be relied on from every official in the building.

Dr. Dorner, the manager, has just completed an excellent catalogue, in which a suitable scientific classification has been made, with interesting information. It is a most creditable work, and when revised, in the next edition, will give an additional importance to the collection.

Here even in midwinter living specimens from our own coast, and from Bermuda, England, and various points on

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the European coast, can be seen and studied. Professor Burt G. Wilder, of Cornell, with all the energy and enthusiasm of true genius, expressed his regret that such a storehouse of Nature was not within his reach, and begged for the dead specimens. Is there no naturalist in our city with a kindred spirit, who will collect a little band of students, and garner the rich harvest of knowledge that now neglectfully lies ready to be harvested?

Communications.

Our Washington Correspondence.

To the Editor of the Scientific American:

From the following figures, showing the issues during the months of January, 1877 and 1878, the Patent Office business appears to be still increasing:

	Patents.	Reissues.	Designs.	Trademarks.	Labels.
January, 1877.....	1,105	33	43	83	27
January, 1878.....	1,168	48	40	137	58

The office has received from the English Patent Office a duplicate set of English patents, which are to be classified according to the nature of the invention and distributed in the examiners' rooms, so that they may be more readily examined in making searches as to the novelty of alleged new inventions. It will take considerable time and money to properly mount the drawings and classify them, but when done its cost will soon be paid for by the increased facilities given the examiners in their work, and it will prevent the granting of many useless and invalid patents that would otherwise be granted for inventions already shown in foreign patents, but which cannot now be found under the present system.

The work of photo-lithographing the back issues of drawings has made considerable progress, all being now done except the following sub-classes: artificial limbs, builders' hardware, coffins, coopering, cutlery, dentistry, locks and latches, locomotives, nut-locks, safes, steam boilers, steam engines, boiler furnaces, steam valves, surgery, wheelwrights' machines, wood sawing, wood turning, woodwork, and wood working tools. These are under way, and will, it is believed, all be finished by the end of the year, so that printed copies of the drawing of any United States patent may then be readily obtained at a moderate price.

The Secretary of the Interior has prepared a communication, which will probably be sent to Congress ere this is printed, calling the attention of that body to the present condition of the roof of the Patent Office, and asking for an immediate appropriation to repair the building in conformity with the recommendations and suggestions made by the commission appointed by the President to examine into the condition of the executive departments. The recommendations of that commission were transmitted to Congress during the extra session, but nothing has yet been done in reference to the matter, and the condition of the Patent Office calls for prompt action, in order that the structure may at an early day be restored and rendered as nearly fireproof as possible. Much of the work of the office is now done to great disadvantage from the overcrowded state of the rooms, and some that should be done in the office is now, to the great inconvenience of attorneys and examiners, done in outside buildings.

CONGRESSIONAL MATTERS.

In addition to the bills relating to the Patent law given in my previous letters, I find the following recently introduced:

House bill 2,345, introduced by Mr. Hartzell, enacts that section 4,898 shall be repealed and the following substituted therefor:

"SEC. 4,898. Every patent, design, trademark, label, or copyright, or any interest therein, shall be assignable in law by an instrument in writing which shall be acknowledged before some officer authorized to take the acknowledgment of deeds where such instrument is executed; and the patentee or owner of the franchise, or his assignee or legal representative, may, in like manner, grant and convey an exclusive right under his patent or other franchise to the whole or any specified part of the United States. Every assignment, grant, conveyance, mortgage, power of attorney, license, shopright, or any other interest in or under any patent, design, trademark, label, or copyright shall be recorded in the Patent Office of the United States; and every such assignment, grant, conveyance, mortgage, power of attorney, license, shopright not so recorded shall be void as against any subsequent purchaser in good faith, and for a valuable consideration, of the same patent, design, trademark, label, or copyright, or any interest therein, whose assignment or conveyance shall be first duly recorded. But no instrument in writing as described in this section shall be deemed invalid or void for want of such acknowledgment if executed before the passage of this act."

The House bill 2,522, introduced by Mr. Blair, adds to section 3 of chapter 301 of the Revised Statutes, relating to the registration of labels, the following:

"And the same right of proceeding against any person who has registered a label pursuant to the provisions of this section shall be allowed, from and after the date of the passage of this act, as is now allowed in relation to trademarks by act approved August fourteenth, eighteen hundred and seventy-six, and entitled 'An act to punish the counterfeiting of trademark goods and the sale or dealing in of counterfeit trademark goods.'"

Another bill (No. 2,524), introduced into the House by Mr. Briggs, will, if it becomes a law, change the fee for registering trade marks from $25 to $5.

Mr. Glover has introduced a bill (No. 2,607) which enacts that section 482 of the Patent law shall read as follows:

"Sec. 482. The Examiners-in-Chief shall be persons learned in the law, whose duty it shall be, on the written petition of the appellant, to revise and determine upon the validity of the adverse decisions of examiners upon applications for patents, and for reissues of patents, and in interference cases; and the Commissioner of Patents is hereby forbidden from exercising, or attempting to exercise, any power or influence over the Examiners-in-Chief in regard to the decision of cases which are before them on appeal from the primary examiners. The decisions of the Examiners-in-Chief shall hereafter be published in the Patent Office Official Gazette, in the same manner as the decisions of the Commissioner of Patents and the Assistant Commissioner of Patents are now published; and the Examiners-in-Chief shall select such of their decisions for publication as they shall deem to be of public and general interest."

A bill (No. 2,628), introduced by Mr. Sampson, strikes out from the Patent law section 4,910, which allows an appeal to the Commissioner, and changes section 4,911 so as to allow any person dissatisfied with the decision of the Examiners-in-Chief to appeal direct to the Supreme Court of the District of Columbia sitting *in banc*.

House bill No. 2,634, introduced by Mr. Oliver, proposes to amend sections 493, 4,897, and 4,911 of the Patent law, so that uncertified printed copies of patents shall be sold at an advance of fifty per centum above the actual cost of printing; that forfeited applications shall be allowed to be revived in the same manner as rejected cases now are, notwithstanding two years may have elapsed without action; and that a party to an interference shall be allowed an appeal to the Supreme Court of the District of Columbia.

In addition to these, I find a number of private bills relating to extensions of the following patents: R. & G. B. Reynolds, June 21, 1859, power loom brake; Cook & Jenkins, January 14, 1862, working siliceous and other calamine ores; H. A. Stone, March 21, 1861, making cheese; J. D. Sarven, June 9, 1857, carriage wheel; Walter Hunt, July 25, 1854, paper collars; F. Cook, March 2, 1858, bale ties; E. A. Leland, August 14, 1861, paint cans; A. B. Travis, April 8, 1862, cultivators; J. A. Conover, May 15, 1855, wood-splitting machine; J. C. Birdsell, May 18, 1858, hulling and thrashing clover; Ira Gill, January 13, 1857, machine for forming hat bodies; S. S. Hartshorn, buckles.

The House Committee on Public Buildings have decided to report favorably a bill for the erection of a building on the Smithsonian grounds to be used as a National Museum, and appropriating $250,000 for the purpose. This building is mainly intended for the reception of the exhibits at the Centennial donated by different foreign governments to the United States, and now stored away in the old arsenal in this city until such time as sufficient room can be obtained for their proper exhibition.

The annual report of the Librarian of Congress, recently presented, shows that this important institution has made gratifying progress during the past year, so far as accumulation of material is concerned. More than 20,000 volumes, besides pamphlets, periodicals, engravings, etc., were added to its treasures. The total number of volumes is now 331,118, and of pamphlets, 110,000. The rate at which this library is increasing will soon cause it to rival the most famous ones of Europe, a prospect which must be very pleasing to all who are interested in our national progress in literature and art. Its attractions draw to this city many scholars from various cities, who find in its alcoves books not to be found anywhere else on this continent. The great drawback to it is the inconvenient and overcrowded space it now occupies, which is so small for the amount of material it contains that about 70,000 volumes are piled upon the floor for want of shelf room.

UNITED STATES PATENT VS. STATE LAWS.

A case in which the question whether or not a patent is sufficient to overrule State laws has just been argued before the Supreme Court of the United States in the case of Patterson *vs.* The Commonwealth of Kentucky; error to the Kentucky Court of Appeals. The plaintiff in error having been indicted for the sale and use of a patented illuminating compound, known as "Aurora Oil," which article had been found by the Inspector of the State, by actual test, to be unsafe for illuminating purposes, and its use prohibited accordingly by the State authorities, brings the case to the Supreme Court on the ground that the authority of the patent is superior to the laws of the State, contending that if the patent does not guarantee the right to vend the patented article the patent is worthless and the protection of the United States no assurance to capital. On the other hand, it is said that the police power of the State is supreme in all cases where the safety of its citizens and their property is concerned, and that Congress has no power to control or regulate the sale of dangerous commodities such as these oils. No decision has yet been given by the Supreme Court at the time of this writing.

BOARD OF STEAMBOAT INSPECTORS.

The Supervising Steamboat Inspectors have been holding a convention in this city, and consulting on various matters connected with steamboats. Reports were received from various members in relation to improvements in boilers, grate bars, life boats, life preservers, testing oils, and other things pertaining to their duties in connection with steamboat service and to the safety of passengers. Several addresses were made by various parties interested in the adoption of alleged improvements in various appliances connected with the general subject of steam transportation. They also had an address from Mr. Boole, of Chester, Pa., connected with Mr. John Roach's iron ship-building establishment, in relation to the deviation of the compass, whose object in addressing the board was to get it to suggest to the Secretary of the Treasury to recommend the further investigation of this important matter by a board of scientists, under the auspices of the government, with a view to the establishment of some standard for the use of mariners, whereby all variations may be readily computed and allowed for in making up a ship's reckoning.

CONSULAR REPORT ON TRADES UNIONS IN ENGLAND.

Our consul at Leeds sends to the Department of State an interesting analysis of the effect which the trades unions exercise upon the industrial enterprises of Great Britain. In his judgment, the original and principal cause of the decline of British industry is traceable directly to the arbitrary regulations of those unions, the organization of which is more perfect in England than elsewhere, so much so that it is to be regretted that they are not as potential for good as they are for evil. But they are too often led by turbulent spirits, who provoke continual conflicts and demand concession after concession until the enhanced cost of production paralyzes the employers' hands, and further concession becomes impossible, which results in a strike, with all its attendant misery, most of which falls upon the innocent non-producers —the wives and children of the strikers. As long as the funds of the union hold out, a bare existence is doled out to the striker, but when exhausted, which soon happens, public charity is the only resource to allay the misery which ensues. The strikes generally end in submission, a result mainly due to the folly of the unions. Another way in which unions impede production and enhance its cost is by forbidding a mechanic of more than average skill to do more than a certain quantity of work in a given time; thus a smart bricklayer can lay no more than his slower brother unionist, lest he should therefore jeopardize his chance of obtaining work. In this and other ways the real amount of labor is lessened and made dearer, the quantity of manufactures diminished, industries paralyzed, and exports lessened, and, with the consequent decrease of profits and outward flow of capital from the country, the necessaries of life become dearer, which weighs most upon the laboring classes, and they are thus the ignorant cause of many of their own misfortunes. Almost all branches of industry suffer from this cause except agriculture, because unions and their resultant strikes are rare among farm laborers.

TECHNICAL EDUCATION.

The Commissioner of Education has returned from the Convention of Presidents of Agricultural and Industrial Colleges held at Cleveland recently, and expresses himself much pleased with the general results of the convention, which was the first of the kind ever held in this country, but he hopes not the last, as he thinks that such conventions cannot fail to promote all branches of technical education. In these matters he says we have fallen behind several of the countries of Europe. American colleges compare favorably with similar institutions abroad in teaching the classics, history, the sciences, and general literature, and our technical schools have made a fair beginning, promising valuable results. In technical instruction he thinks that Germany is somewhat in advance of most other countries. There young men and women may receive instruction in schools in any industrial pursuit they may wish to follow. For example, pupils are taught in these schools to sample and test oils, to judge the quality and grade of different textile fabrics, and to classify grains: and in metals they may learn the whole process of working, from the time the ore is taken from the earth until it leaves the machine shop a finished tool.

THE NATIONAL PARK.

Several gentlemen interested in the care of the Yellowstone Park have been holding a convention in this city. Professor Comstock, the geologist, of Cornell University, is their chairman, and Mr. P. W. Norris, at present the Superintendent of the park, is here in conference with them. It is understood that the association favor the establishment of signal stations, the employment of a paid superintendent, a survey of the boundaries. and other measures for the proper care and preservation of the park in the interests of science. While this wonderful region is the property of the United States, and abounds in natural beauties, mineral formation, and natural curiosities such as perhaps can be found in no other spot in the world, no care has ever been bestowed upon its preservation from depredation and despoilment. It is the object of these gentlemen to make such suggestions as may seem needful to this end, and to urge their adoption by adequate legislation by Congress.

Washington, D. C. OCCASIONAL.

A Practical Puzzle.

To the Editor of the Scientific American:

A civil engineer working on a railroad in Illinois recently had occasion to weigh one of the iron rails. The rail was 30 feet long, and was supposed to weigh about 400 pounds. His only means of weighing was a pair of balance scales capable of weighing only 25 pounds. Query: How can he weigh the rail correctly with such scales? J. T. C.

Rockville, Ind.

[Our correspondent sends us an ingenious answer to this problem, but we withhold it for the present to admit of our readers trying their skill at a solution.—EDS.]

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Microscopical Notes.

Hardwick's *Monthly Microscopical Journal* (London) will not be published in future; the Royal Microscopical Society will therefore probably publish its own proceedings.

The society has for some time desired to adopt this course, and it was referred to by the President in his address in February, 1875, when he expressed his regret that the intemperate correspondence carried on during the previous year in the *Journal* should have appeared in conjunction with its proceedings.

It is not easy for those outside the charmed circle to imagine how language could have been employed on a question of the "angle of aperture" that should have drawn forth such a rebuke. This style of scientific warfare appears to have commenced in 1871, when Washington hurled at Massachusetts the epithets "vulgar," "insolent," and "offensive," in reply to a charge of "deception." Later, when the war was carried on between Boston and London, mutual charges of "ignorance" of first principles, etc., appeared to be the favorite means employed to keep those in the fray at a fever heat.

Well might Mr. President Brooks remark that "if in a question of optics an alleged ignorance of some of the first principles of that science be manifested, and thereby a feeling of irritation rather than one of compassion be evoked, surely the blame must rest more with individual temperament than the nature of the question at issue."

Let us hope that in future an opinion may be courteously expressed on microscopy without rousing any of the "*genus irritabile microscopicorum.*"

The recent and last experiments of Professor Tyndall in opposition to the "spontaneous generation" theory, although highly successful, must be merely regarded as a defeat to those who have asserted that the truth of the "theory" has been proved.

The question itself of the spontaneous generation of life still remains a problem for investigation, to tax the energy, perseverance, and intelligence of scientists.

Professor Tyndall has, however, done good work in setting back the "question" to its proper position—it is early days for expecting the solution, for one must possess a child-like simplicity to suppose the mighty issues here at stake are to be settled by a few experiments. It is Nature's greatest secret, and she will reveal it only to those who patiently unravel the apparent skein of mystery which surrounds it.

To those who study the lowest forms of life, and the embryology of the higher organizations, the belief in some form of the hypothesis of a "bio-genesis" forces itself with irresistible conviction. The knowledge thus acquired also distinctly proclaims the impracticability of decisive demonstration until an immense amount of work has been performed that must remove the date of the solution of the question to later generations.

The very basis on which investigation is conducted is continually changing, and new discovery is almost forcing the conclusion that the whole work of past naturalists must be revised.

Here is a piece of "protoplasm" which we can weigh, chemically analyze, and submit to microscopical examination, and so transparent that observations can be carried on almost to the verge of its molecular structure—a mere tiny atom of albuminous matter, but a mass of vitality. What is it? Who can explain the potentiality that creates or maintains the existence of the Amœba? It has the power of locomotion, reproduction of species, and can assimilate food, without the aid of any visible organized parts. If we cannot yet explain the nature of the agency here at work in a form of life that is visible and capable of analysis and examination, how can we pretend to solve the hypothesis of its genesis, probably in a condition beyond the limits of human vision?

Let therefore micro-naturalists renew their work with vigor, conscious in the belief that if their efforts are not crowned with immediate success, they will at least contribute to the garner of human knowledge, and pave the way to the solution of a problem that will doubtless influence the destiny of mankind.

Improvement in Extinguishing Fires on Shipboard.

The new steamship Sandhurst, 1,600 tons gross register, lately left Glasgow with a full cargo of coals for Bombay. The question of the extinction of fire, which so frequently takes place spontaneously in coal cargoes, has long engaged the attention of ship owners and others, and we are not quite certain whether systematic effectual means have hitherto been adopted to put out fire when once it arises in a coal cargo. The owners of the Sandhurst have long studied this question, and at their request the builders have succeeded in placing on board this vessel a very sensible and powerful machine to enable the crew, in case of fire, to drown it out by large volumes of water. The machine is a large brass pump worked by an engine attached and fed by a 4 inch copper pipe from the sea. The pump is powerful enough to supply a steady bore of water the full size of the pipes, which are led for delivery fore and aft the decks, and can raise and discharge 10,000 gallons an hour. The pump is arranged so that when a quantity of water has been pumped into the hold on a burning cargo the seacock can be closed and the water pumped up and either discharged overboard or again used to saturate the cargo. In addition to the pump to extinguish fire when it does break out there is an arrangement of pipes throughout the hold through which the thermometers can be passed to test the temperature of any part of the cargo. A number of self-registering thermometers, specially made for this purpose, are on board the ship, and it is intended to test and register the temperature at certain intervals, so that the heating of the cargo in any part may be detected, Where the coals are densely stowed, and through which the thermometer pipes cannot be placed, iron rods are passed through the coals, which can at periods be drawn out to test the temperature in those places. A number of gentlemen connected with influential underwriting firms and the shipping interest in Glasgow visited the ship to inspect the arrangements referred to, and the general opinion is that they are such as to reduce to a minimum the risk of fire ever obtaining a mastery over the ship, or even breaking out. The Sandhurst is the third ship launched during the last twelve months by Messrs. Archibald M'Millan & Son, Dumbarton, for her owners, Messrs. W. R. Price & Co., London.—*Marine Engineering News.*

Stoney's Force.

In a recent lecture on the spheroidal state of liquids, Professor Barratt said: To Mr. Stoney is unquestionably due the great honor of having been the first fully to explain the true theory of the radiometer. It was in the course of these investigations that Mr. Stoney has quite recently been led to show that the force which is so active in the high rarefaction (that is necessary for the effective rotation of the radiometer) is also present at ordinary atmospheric tensions. Now it is this force which forms the new explanation of the entire phenomenon of the spheroidal state. Professor Barratt proposed to call it "Stoney's force." In order to understand the action that occurs it must be recollected that, according to calculation, the number of molecules of air that at ordinary pressure occupy the space of a pin's head is 1,000,000,000,000,000,000; when the radiometer globe is exhausted of these molecules of air as far as we can do it by mechanical means, there are still some few millions remaining, and these are in constant motion. Heat makes them move more rapidly, cold more slowly. If we have two surfaces very near each other, one surface hot and the other cold, from the hot surface the molecules will be thrown off with greater rapidity than they reached it; and if the cold surface be near enough, they will "bombard" it. Hence there will be a tendency in the hot and cold surfaces to retreat from one another, and when with one of these, as in the radiometer, this is possible, it ensues. This force would obviously disappear (1) if the residual molecules could be wholly removed or so lessened in number that their action would be insensible, or (2) if the surfaces were so far apart that the augmented molecular activity had expended itself before reaching the cool surface. Applying the same kind of reasoning to the spherical state of liquids, we can see that it is only at relatively short distances from the metal the interaction will occur. A number of experiments were in conclusion shown, some with fluids from which there could be no vapor, such as the old theory requires, and others with fluids in which the difference in temperature was slight.

A Railroad Velocipede.

Mr. Johnson, a traveling musician, being in Garland, Col., and anxious to depart, manufactured a velocipede with which he proposed to travel into Texas. Having become possessed of two two-wheeled velocipedes, such as were in common use a few years ago, he proceeded to fasten them together to run on a railroad. Wooden axles were constructed so that the machine could be adapted to any gauge of track; a broader tread was placed on the wheels, to which were added flanges made of whisky barrel hoops; levers were fitted to give means for using the hands as well as the feet to gain motive power; the whole arrangement was given a coat of red paint, and it was placed on the track at Garland ready for service. The machine weighs about forty pounds, and is easily handled. The operator sits on a seat resting across what were the two seats of the old velocipedes.

Johnson mounted his novel traveling apparatus at Garland, and arrived here without accident, having made the trip at the rate of about fifteen miles per hour. He remained in this city a day or two, and altering the gauge of his car to suit that of the Atchison, Topeka & Santa Fe R.R., he started out on Friday afternoon for the East. Our informant tells us that he saw Johnson near Goldsmith's ranch, and tried to keep up with his car on a good horse, but the animal was soon distanced. The engineer of the eastern-bound passenger train met Johnson at Apishapa.

Johnson is an old railroad man, and always provides himself with a time card, so that he can keep out of the way of the regular trains. His apparatus is so light that it can be moved from the rails in a moment.—*Golden (Col.) Globe.*

Intermarriage of Relatives.

Mr. George Darwin, after searching investigation, concludes that "the widely different habits of life of men and women in civilized nations, especially among the upper classes, tend to counterbalance any evil from marriage between healthy closely related persons." Mr. Darwin's views are in a measure sustained by Dr. Vorni's inquiry into the commune of Batz. Batz is a rocky, secluded, ocean washed peninsula of the Loire Inferieure, France, containing over three thousand people of simple habits, who don't drink and commit no crime. For generations they have intermarried, but no cases have occurred of deaf-mutism, albinoism, blindness, or malformation, and the number of children born is above the average.

Relative Cost of Water and Steam Power.

It having been stated in the *Journal of the Franklin Institute* that "the cost of raising water by water power at the Fairmount Works in Philadelphia was but 2 cents per one million gallons, raised 1 foot," Mr. Henry P. M. Birkinbine now says that the 2 cents referred to were expended for simply running the works, that is, attendants, oil, tallow, and ordinary repairs; it did not, however, include the entire cost, but left out of consideration the extraordinary repairs incidental to water power—those of maintaining the dam, head race, gates, etc. Had the calculation been properly made, it would have shown that the cost of raising water at Fairmount by water power was from 10 to 12 cents per million gallons, one foot high.

Mr. Birkinbine makes the correction because it was asserted that had steam power been employed instead of water it would have caused an additional outlay of $13,000 to $19,500 per annum. The conclusion at which Mr. Birkinbine arrives, on a consideration of the whole subject, is that, since the steam engine has been brought to the degree of perfection in simplicity, efficiency, economy, and reliability as we now have it, and as there are few locations in the thickly settled portions of our country where fuel cannot be procured at a moderate price, steam is preferable to water power. This is particularly the case where the water power is unfavorably located, and when the trouble incident to droughts, floods, etc., is taken into account.

Water Tube Boilers.

Mr. Robert Wilson states that the following appear to be the points that require special attention in designing water tube boilers, to insure their satisfactory working and durability:

1. To keep the joints out of the fire.
2. To protect the furnace tubes from the sudden impingement of cold air upon them on opening the fire door.
3. To provide against the delivery of the cold feed direct into the furnace tubes.
4. To provide means for a proper draft circulation, in order to carry away the steam from the heating surfaces.
5. To provide passages of ample size for the upward currents of steam and water, which must not interfere with the downward currents of water.
6. To provide passages of ample size for the steam and water between the various sections of the boiler, in order to equalize the pressure and water level in all.
7. To provide ample surface for the steam to leave the water quietly.
8. To provide a sufficiently large reservoir for the steam in order to prevent the water being drawn out of its proper place by suddenly opening a steam or safety valve.
9. To provide against the flame taking a short cut to the chimney and impinging against the tubes containing steam only.

The Biscuit Compass.

The manner in which erroneous statements sometimes find circulation in the newspapers is illustrated as follows:

A half column appears in print descriptive of a new process for preparing, baking, and putting up in sealed packages for market an improved food in very compact form, specially intended for long voyages, military purposes, hunting expeditions, etc. This paragraph is "boiled down" by the next editor, who is short of space, as follows:

"A London firm has introduced a hunting biscuit, containing in a small compass a great amount of nutrition."

Editor number three wants something still a trifle shorter, and so "reboils" the above item, making it to read:

"A London firm has introduced a hunting biscuit containing a small compass."

The original statement is thus transformed into a curious falsehood; and many people, with both items before their eyes, would fail to notice any fallacy in the last, because every word given is contained in the preceding item.

A Telephone Recipe.

Professor Barrett, in a recent lecture on the telephone, gave a recipe for making a cheap one. Take a wooden tooth-powder box and make a hole about the size of a half crown in the lid and the bottom. Take a disk of tinned iron, such as can be had from a preserved meat tin, and place it on the outside of the bottom of the box, and fix the cover on the other side of it. Then take a small bar magnet, place on one end a small cotton or silk reel, and round the reel wind some iron wire, leaving the ends loose. Fix one end of the magnet near, as near as possible without touching, to the disk, and then one part of the telephone is complete. A similar arrangement is needed for the other end. The two are connected by the wire, and with this Professor Barrett says that he has been able to converse at a distance of about 100 yards.

The Planet Mars.

Recent telescopic observations of the planet Mars have been made at Madeira by Mr. N. E. Green, whose drawings, made direct from the telescope, are said to surpass, both in accuracy and fullness of detail, all that have been previously made, including those by Mr. Dawes. Mr. Proctor's observations are also corrected in several instances. Mr. Green's observations would also appear to confirm an opinion previously expressed, that the "snow caps" do not agree with the poles of the axis of revolution.

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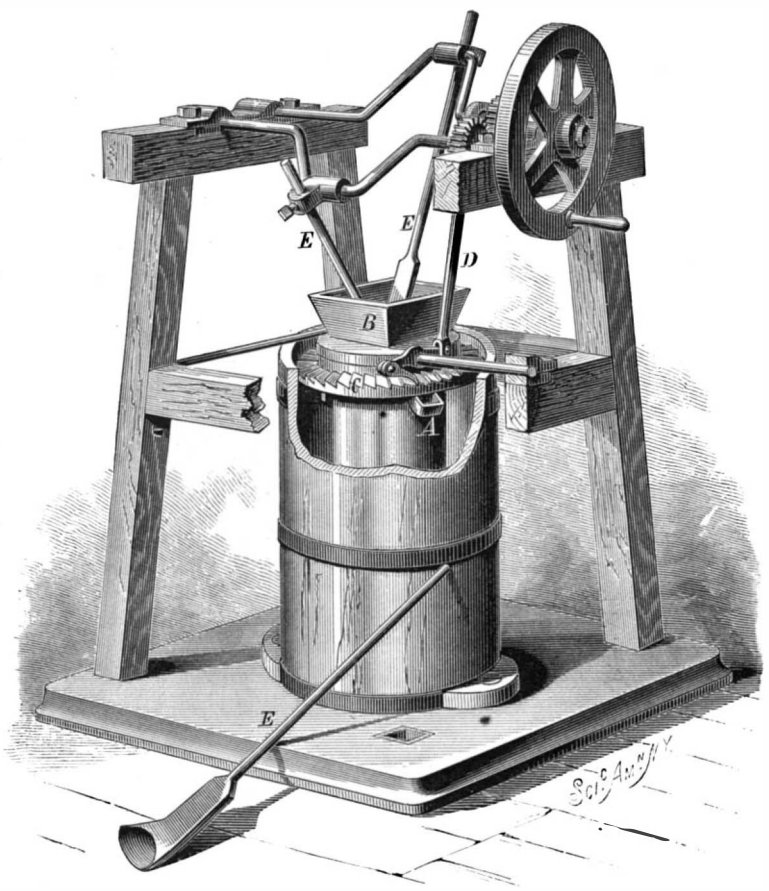
WISE'S ICE CREAM BEATER.

We illustrate herewith a new machine for beating ice cream during the freezing process. The advantages claimed are noted below. The mechanical construction is as follows: The cream can, A, is placed in a suitable ice tub, and upon its upper edge is placed the top, B, which extends over the rim inside the ratchet teeth, C, and also partially covers the top of said can. A central opening above, which is a hopper-shaped chute, is provided. The cover thus constructed prevents the cream from splashing out while the beaters are in motion, and it is secured by braces connecting with the frame. One of these braces serves as an axis on which an arm, carrying a hinged pawl, may be worked by means of a pitman, D, and eccentric operated by the crank handle shown. On the shaft are two cranks, and on the latter are sleeves in which the beaters, E, are secured. The revolutions of the crank arms cause the beaters to pass alternately back and forth in and through the cream can and its contents, rising as they end and descending as they begin the stroke. The paddles are constructed as shown, and the ratchet teeth on the upper edge of the can are engaged by the pawl, which thus causes the can to revolve on its vertical axis.

The following advantages are claimed: The cream is beaten in the same manner as by hand, and two thirds of the manual labor is saved. The machine being run regularly, the can, turning one half inch to stroke of the beaters, makes cream as fine and more evenly than can be made by hand. The cream being frozen two thirds stiff by the freezing apparatus before using this machine, there is no danger of beating the richness of the cream into butter before the freezing takes place. The top of the can and ratchet rim are so constructed that they can be placed over any can of one size, thereby doing away with the necessity of having a certain tub and can for each machine, and so saving the labor of changing and packing the cream for every additional freezing. The beaters having a peculiar shaped tip bent in such a manner as to give greater dash to the cream, greatly facilitate the operation; and lastly, the machine is simple in construction, strongly built, not easily put out of order, and easily duplicated in all its parts. For further particulars as to State rights for sale outside of Pennsylvania and proposals for building the machine, address the inventor and patentee, Mr. Wm. E. Wise, Williamsport, Pa.



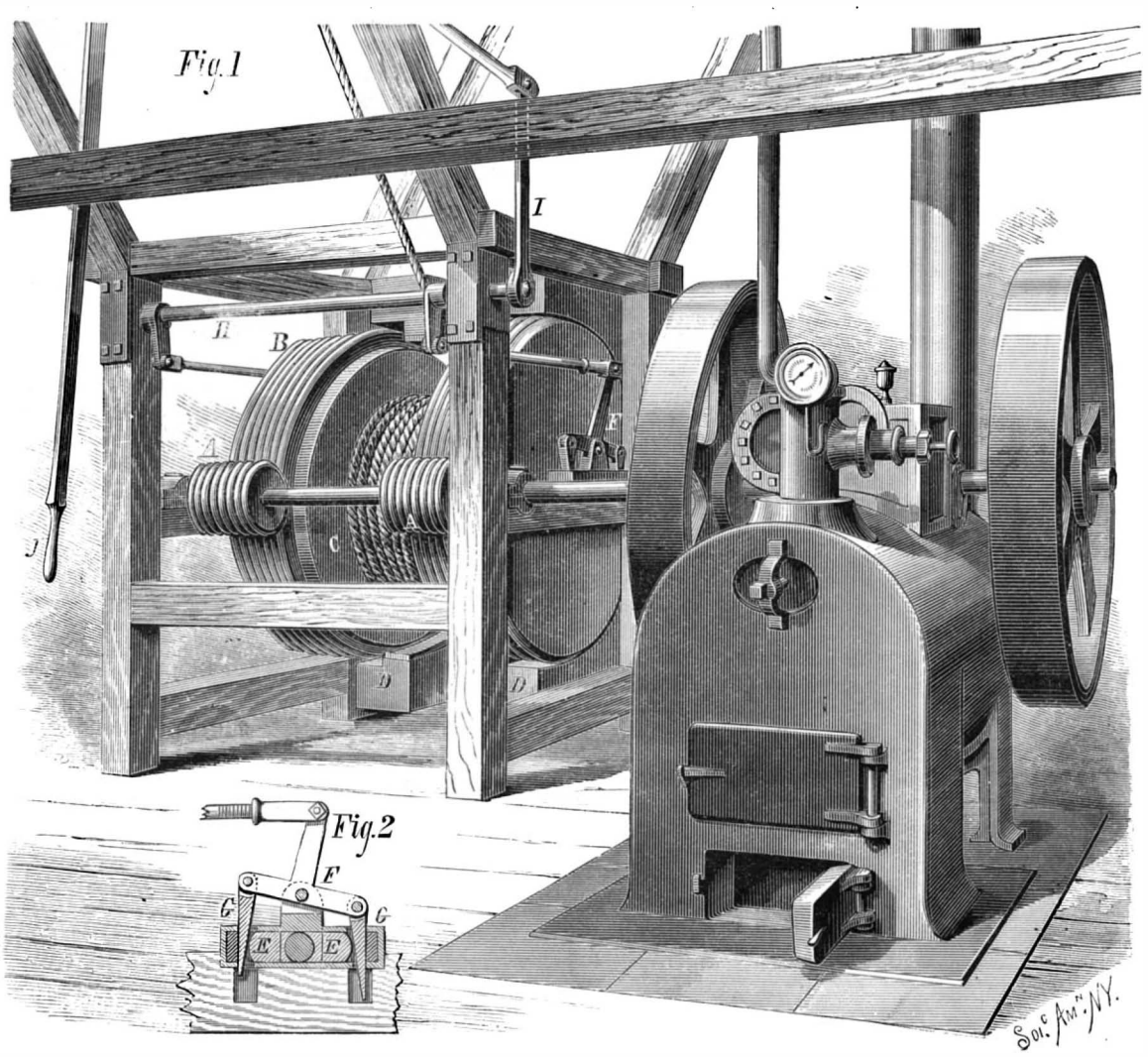
WISE'S ICE CREAM BEATER.

AN IMPROVED HOISTING MACHINE.

We illustrate herewith an improved hoisting machine especially suited for mining use, which embodies a new arrangement of wedges and levers for shifting the winding drum into and out of gear, and also into and out of contact with the brake shoes. The driving shaft carries two grooved friction wheels, A, which gear with the larger wheels, B, on the winding drum. The wheels, B, are of wood, the grain of which extends in a radial direction, and beside each is a friction disk, C, which rotates in close proximity to the copper-faced brake, D, which is attached to the frame. In Fig. 2 is shown the box wherein the shaft of the winding drum has its bearing contains two blocks, E, concave on the sides nearest the shaft and convex at their outer sides. From the center of the cap projects a forked standard in which is fulcrumed the T-lever, F, to opposite arms of which are pivoted the wedges, G, which enter the box and come in contact with the convex ends of the blocks, E, as shown. These wedges are backed by a filling of Babbitt metal in the casing which holds them against the block ends. The upper arm of the T-lever is connected with an arm on the rock shaft, H, to which last is attached a lever, I. At the opposite end of the winding shaft similar arrangements are provided, so that both ends of the winding shaft are moved simultaneously when the rock shaft is turned.

By moving the lever, I, toward the hoisting drum, the forward edges are forced into the boxes and act upon the blocks so as to move the winding shaft and its wheels away from the small gear wheels, A. The drum being thus released is free to rotate unless the movement of the lever, I, is continued until the friction disks, C, are thrown into contact with the brake shoes, when the motion may be controlled at pleasure. By reversing the movement of the lever, I, the drum is carried forward so as to release the friction wheels from the brake shoes and to bring the large gears into contact with the driving wheels. The lever, I, is suitably connected with the hand lever, J, with which may be combined mechanism so arranged that when the gearing is thrown out of contact the engine valve is regulated in accordance.

Patented January 8, 1878. For further particulars address the inventor, Mr. P. C. Johnson, Black Hawk, Colorado.



JOHNSON'S IMPROVED HOISTING MACHINE.

The Woods of Bahama and Trinidad.

There are many valuable timber trees in both these islands, whose wood is largely used for cabinet-making purposes. Horseflesh mahogany is sold for fancy prices in this country when good specimens are offered; but in Bahama it is principally used in house building, and the branches and crooked trees for ship timber. It is a very durable wood, and grows on several of the Bahama islands, but is found of large size and in greater quantities at Andros Island, where it grows to about 20 feet in length and 2 feet in diameter. It is, however, seldom brought out of the woods of that size, for want of proper means of conveyance. It is a hard, fine-grained wood, and exhibits numerous open cells. The principal uses made of dogwood are for fellies for wheels and for ship timber From its toughness and other properties, it is better adapted to the former purpose than any other of the Bahamian woods. The tree does not attain any considerable size, and is generally crooked; a rather soft, open-grained, but very tough wood.

Stopperwood is principally used for piles and for wheel spokes. It is a very strong and durable wood, and grows from 12 to 16 feet long, and from six inches to eight inches in diameter. It is found on all the Bahamian islands, and is an exceedingly hard, fine, close-grained, and very heavy wood.

Lignumvitæ grows on several of the Bahama islands, and is generally exported to Europe and America. The principal use made of it in the Bahamas is for hinges and fastenings for houses situated by the sea shore or in the vicinity of salt ponds on the islands, where, from the quick corrosion of iron hinges, etc., metal is seldom used.

Bahama satinwood, so well known in the London market, and also called yellow wood, grows abundantly on Andros Island and others of the Bahamian group, and to a large size. It is a fine, hard, close-grained wood, showing on its polished surface a beautifully rippled pattern.

Bahama mahogany grows abundantly on Andros Island and others of the Bahama group. It is not exceeded in durability by any of the Bahama woods. It grows to a large size, but is generally cut of small dimensions, owing to the want of proper roads and other means of conveyance. It is principally used for bedsteads, etc., and the crooked trees and branches for ship-timber. It is a fine, hard, close-grained, moderately heavy wood, of a fine, rich color, equal to that of Spanish mahogany, although probably too hard to be well adapted for the purposes to which the latter is usually applied.

Crabwood is mostly used for picture frames and small ornamented cabinet work, etc. It seldom grows larger than from three to four inches in diameter, and is a rather hard, fine, cross-grained, moderately heavy wood. The heartwood is of a beautifully veined Vandyke brown, its external edge bright black, and the alburnum of a pure white. In Trinidad the balata is a timber extensively used for general purposes, and much esteemed. Its diameter is from two to six feet. The mastic is also held in high estimation, and varies from two to four feet in diameter. The gru-gru, which is a palm, yields beautiful veneer, as also does the gri-gri. For some of these trees it will be observed thatwe have no vernacular name, consequently the choice lies between the native and the botanical name. The heartwood of the butterwood only is used. The beauty of the wood is well known, but it never attains a large size. Its recent layers are of a uniform yellowish white color. The carapa bears a considerable resemblance to cedar, and is extensively used and much esteemed. It is from two to three feet in diameter. The West Indian cedar of Trinidad is a most useful timber, and is well deserving the attention of consumers, as is also the copai, a beautiful and durable wood. The sepe is a light wood, resembling English elm, impregnated with a bitter principle, which preserves it from the attacks of insects. It is tough, strong, and is used for general purposes. In diameter it ranges from one to two feet. L'Angelme is a strong, hardy wood, exclusively used for the naves of wheels, etc. Courbaril is a valuable and abundant timber of from two to six feet in diameter, and may be otherwise described under the name of West India locust. Yorke saran is a very hard and useful wood, and also pearl heart, which has the advantage of being very abundant, and runs from two to four feet in diameter. Aquatapana is a very durable and curious wood, susceptible of high polish, and from 18 to 36 inches in diameter.

The green, gray, and black poni furnish the favorite timbers of the colony, and produce the hardest and most durable of wood. Their timber takes a fine polish, has a peculiar odor, and is very abundant. The trees are from three to four feet in diameter, and proportionately lofty.

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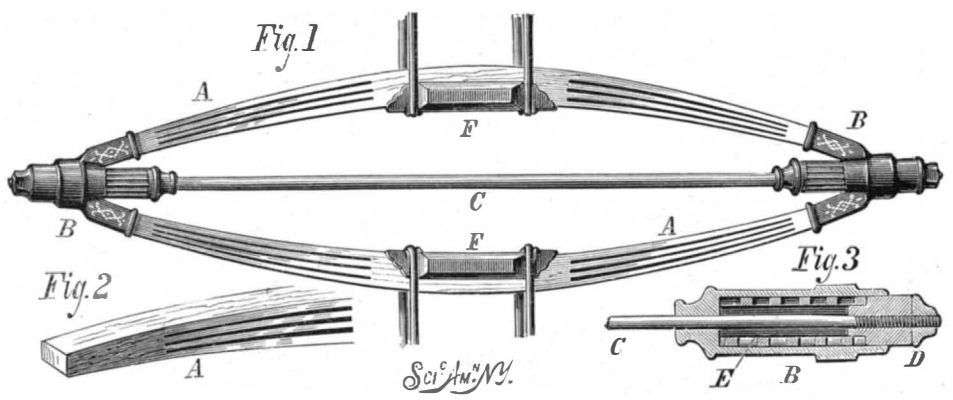
THE THOMPSON WOODEN SPRING FOR VEHICLES.

We illustrate herewith a new wooden spring which may be adapted to any variety of vehicle, from children's carriages to railway cars. The advantages claimed for it are that it is light, strong, and durable; that it can be adjusted to carry with safety a greater or less weight; that frost has no effect upon it, and that its cost is about one fourth that of steel springs.

The ends of the wooden spring bars, A, are inserted in cast iron sockets, B, where they are separated by small central tongues. C is a tension rod, the extremities of which pass through the centers of the castings, B, and have nuts, D, screwed on the ends. The outer portions of the nuts are square, so that they may be readily grasped with a wrench, and their inner parts are cylindrical and fit against spiral springs, E, placed in the castings, B. Said springs assist the wooden bars, A, to recover their former position when the pressure is removed. By this construction, by simply adjusting the nuts, A, the strength of the spring may be increased or diminished as desired to suit the weight supported. The clasps, F, protect the bars, A, from wear, and all metal work is handsomely plated or bronzed.



THE THOMPSON WOODEN SPRING FOR VEHICLES.

We are informed that a pair of these springs, weighing 12 lbs., takes the place of a pair of 40-lb. steel springs, and that four such wooden springs, weighing 36 lbs., may be substituted for as many steel springs of 250 lbs. weight. The device can be applied in side bar as well as in elliptic form, and no change of fastening is required to insert it in place of a steel spring in case of the latter being broken or injured.

Patented through the Scientific American Patent Agency, December 18, 1877. For further particulars address the proprietors, Messrs. Thomas Ledwich & Co., Avoca, Iowa, or George H. Thompson, General Superintendent, Omaha, Neb.

A Deaf-Mute Telegrapher.

Considering the fact that in telegraphy, as now practiced, all messages are read from sound, and that on the quickness and good training of the ear depends, to a great extent, an operator's skill, one of the most remarkable cases (in fact, the only one) on record in this or any other country was that of the late Samuel J. Hoffman. Having lost his hearing entirely a short time after learning telegraphy, he nevertheless continued the practice and successively occupied prominent positions as long as he lived. He made use of a sounder of his own construction, and received by placing his hand over it in such a manner that he could feel distinctly every vibration of the armature. He would thus continue to receive by the hour without "breaking," and experienced no difficulty except when the wire worked hard or the circuit changed frequently; he obviated this by placing his fingers on the binding screws of the relay, distinguishing the characters by the variations of the current. He died in Florida, having gained the reputation of being a most thorough operator and electrician.

THE INDIA RUBBER TREE.

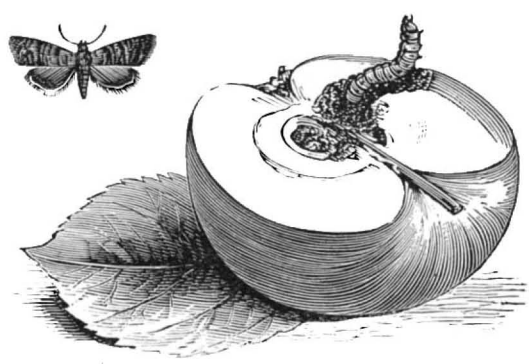
Caoutchouc, or India rubber (called by the South American Indians *cahuchu*), is the inspissated juice of a number of trees and plants found in Mexico and Central America, in Brazil, Guiana, Peru, and in the East Indies. The illustration represents a twig of the Mexican tree (*Castilloa elastica* Cerv.) in blossom. This tree is a genus of the order *Artocarpaceæ*, and is very similar in appearance to its South American cousin, the *Siphonia elastica*, which is the most prominent source of supply of caoutchouc. The *Ficus elastica* of the Ganges, another congener, is described as one of the noblest of trees; while all the varieties of the India rubber tree may be classed among the most useful of Nature's products. The Mexican tree grows from 50 to 100 feet high and from 8 to 20 inches in diameter. It has male and female flowers alternating on the same branch. The male flowers have several stamens inserted into a hemispherical perianth, consisting of several united scales. The female flowers consist of numerous ovaries in a similar cup. The juice of the tree is tapped at several incisions in the trunk, and after various processes of manipulation appears in the form of the crude India rubber of commerce.

The Orograph.

At a meeting of the French Academy of Sciences, December 10, M. Schrader exhibited his orograph and a geographical map of Mont Perdu made with it. The instrument consists of a circular paper-covered plate with central vertical axis carrying a sleeve which can turn round freely. On the top of the sleeve is a telescope, the movements of whose frame in the vertical direction are communicated to a pencil, and transformed by gearing into to and fro movements. If the telescope describes a circle round the horizon, the style describes a corresponding circle on the plate; if the telescope goes up or down, the trace produced is further from or nearer to the central axis. A spirit level being fixed to the telescope, the circle made when it is even gives a means of estimating the height and depressions.

THE CODLING MOTH.

The well known German pomologist, Dr. Edward Lucas, has recently called attention to a simple method of guarding against the ravages of that tiresome insect plague, the caterpillar of the apple or codling moth (*tortrix pomona*). For an illustration of the moth and grub we are indebted to *The Garden*. The plan is dependent for success on the fact that the moth most frequently deposits her eggs between the leaves of the calyx, whence the grub afterward commences its attack on the heart or pulpy portion of the apple, and finally escapes by a hole made in the circumference. Observing this, it occurred to Mr. Krausz, of Stuttgart, the discoverer of the remedy, to try the effect of cutting off the calyx, quite low down at its base, as soon as the apple should have attained the size of a hazel or walnut. The prominent situation of the calyx at that period of the fruit's growth greatly facilitates its removal, and in the case of some hundreds of apples Mr. Krausz experimented on—several hundreds can be done in an hour—none appeared afterward to be the least injuriously affected by the operation. In those instances in which the cutting slightly damaged the calyx tube the wound soon healed over and became covered with a yellowish-green, cork-like substance, the latter eventually closing the tube, and thus creating an impassable barrier to the insect. As regards the shape of the apple, this is somewhat altered by the above treatment, so as to render the variety less easily distinguishable, but the slight diminution in length, resulting from its adoption, is more than compensated for by increased thickness, total absence of grub, and, consequently, generally finer appearance. For the purposes of comparison, a considerable portion of the fruit on each of the trees selected for experiment had been left in its natural state, and the apples operated on were chosen quite at random, regardless of aspect or situation. The fallen fruit under the different trees was found to consist exclusively of such as had not been operated on.



GRUB OF THE CODLING MOTH (*Tortrix pomona*).

TWIG OF THE MEXICAN INDIA RUBBER TREE ("CASTILLOA ELASTICA") IN BLOSSOM.

New Agricultural Inventions.

Mr. William P. Brown of Zanesville, Ohio, has patented an improved Cultivator Tongue, in which the advantage of the double tongue in separating the team, to prevent them from stepping upon the row of plants, is secured without the objection of cramping the team in turning. This is accomplished in an ingenious manner by combining with a single tongue a wheel, disk, reel, or other separating device, which is located upon the tongue in such manner as to secure the desired result in a simple and practical manner.

Messrs. Leonard L. and Daniel Lumbert, of Marston's Mills, Mass., have invented a new Apparatus for Gathering Cranberries, which is simple in construction and convenient in use, enabling the cranberries to be gathered much more rapidly than in the usual way. The raking apparatus may be floated upon the water or used upon dry ground, in either case gathering the berries quickly and effectively.

A practical improvement in Bale Ties for cotton bales and other purposes has been devised by Mr. Wm. M. Seaman, of Bullitt's Bayou, La., which consists in the combination of a U-shaped buckle, corrugated lengthwise on the inside, and a metallic strap or band, the ends of which are corrugated crosswise, for the purpose of being held from slipping when placed to overlap each other, and inserted to fit in the opening between the corrugated inner sides of the buckle. Lateral motion is guarded against by notches in the buckle, forming a shoulder against which the band presses.

An improved Poke, or device for preventing horned cattle from throwing fences or goring, is made of an outer plate and an inner plate formed to suit the angles of the animal's head and horns, kept apart a short distance by springs and held together and in place by flexible stays; and also having the outer plate armed with hinged points, conducted through the lower plate to come in contact with the head when any attempt is made to use the horns. This is the invention of Messrs. David S. Ludlum, of New Hampton, N. Y., and Louis W. Ludlum, of Orange, N. J.

Mr. Isaac O. Sailor, of Montgomery City, Mo., has invented a Stump Extractor, the novelty of which consists in a combination of straps with the cross bars and posts of the apparatus against the downward pressure of the lever. The latter is operated by a rope and pulleys in connection with a horse windlass.

An improved Machine for Measuring and Packing Tobacco has been invented by Mr. C. C. Clawson, of Raleigh, N. C. It has a revolving table which carries the filling apparatus, containing the empty bags in forms, under a chute, after which the bags are filled by a plunger and follower.

Mr. D. P. Ferguson, of Janesborough, Ga., has devised a light Plow, suitable for furrowing, cultivating, etc., in which the standard is pivoted near its middle to an inclined brace, whose upper end is pivoted to the rear end of the beam. The standard may be adjusted at various inclinations to vary the depth at which the shovel or plow proper shall enter the soil, and is clamped and held in any adjustment by friction with a slotted wedge which is placed on the upper side of the beam and under a cross bar or rod passing through the forked end of the standard.

Mr. A. H. Ballagh, of Macon City, Mo., has patented an improved Harrow, which may be readily adjusted to hold the teeth in any desired position from vertical to horizontal when at work, the machine in the latter case being used as a clod crusher, thus combining two implements in one.

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New Mechanical Inventions.

A Safety Car Wheel and Lubricating Device have been invented by Mr. Benjamin F. Shelabarger, of Hannibal, Mo. The wheel is cast with a conical or converging flange, which projects a short distance over the axle box. The under surface of the axle box is convex and of the same curve as the inner edge of the flange on the wheel, so that should the axle break the car will be supported by the engagement of the under surface of the box with the projecting flange of the wheel. This flange serves another purpose, that of catching the oil which is thrown out by the jarring of the truck, and conveys the oil so gathered back into the box from the top of the chamber in the wheel formed by the flange, the oil being thrown outward by centrifugal force and led to the box. An inclined flange on the inner face of the box conveys the oil which may fall on the outside of the box to the annular chamber in the wheel formed by the first mentioned flange.

Mr. Theodore J. Palmer, of New York city, has made an improvement in Rocking Chairs, in which the rocking frame acts upon a base part to which it is secured by a spiral spring, and in motion is rendered reliable and uniform by an arrangement of overlapping side pieces, stop pins, and outer swell portions, which secure the position of the rockers upon the base frame, preventing lateral motion, and also tipping beyond a fixed point. The spring holds the chair in its normal upright position when not rocked.

An improved Tunneling and Excavating Machine has recently been patented, which is constructed with a cylindrical case or shield having a concave socket to which the convex portion of an interior case is fitted. The latter carries the excavating mechanism. Within it there are two concentric drums, the outer one of which rotates in contact with longitudinal rollers carried by the case, and the inner one rotates with the outer one and is capable of sliding longitudinally in it, being guided and supported by friction rollers. To the rear end of this drum a chain wheel is secured for receiving the driving chain, and to its front end a series of cutters are attached. A shaft carrying an earth auger is journaled in the center of the inner drum, and there are suitable devices for operating and adjusting the various parts. This machine is the invention of Mr. Hawley N. Cargill, of Grand Rapids, Mich.

An improved Churn is the invention of Messrs. John A. McConnell and Wm. V. McConnell, of Houston, Texas. By suitable gearing the motion from a crank operates a vertical dasher shaft having a head on the lower end secured in a box, and the whole so arranged that the cover and its attachments may be removed without disconnecting the dasher shaft.

Mr. Thomas Percival, of Napanock, N. Y., has invented a Door Latch which is operated by a spring thumb piece projecting over a handle. This latch is also made in reversible form, and may be locked by a key which fits in a key hole in the handle.

Mr. Joseph B. Stone, of Jersey City, N. J., has invented an improved Lock Hinge for shutters, gates, doors, etc., by which they may be securely locked into open position, the novelty consisting of a combination, with a second guide sleeve of the swinging hinge section, of a vertically sliding gravity catch with wedge-shaped ends, that passes over and locks to the fixed pintle bracket of the hinge.

Mr. Wm. Birch, of Salford, Eng., has invented a Machine for Opening, Smoothing, Spreading, and Guiding Fabrics, for the use of bleachers, dyers, calico printers, and others. In it the fabric, after passing through heaters, is led under and over rollers having ribs spirally radiating from the center, and through a governor, which, by springs, regulates the motion.

David P. Sularff, of Mifflintown, Pa., has invented a Mill Feeding Apparatus, by which the grain or grain product is agitated in the hopper and fed downward into the eye of the runner through a tube, by means of a spirally flanged shaft, and then discharged laterally at the bottom of said tube by a ribbed revolving cone. A sleeve is applied to the lower end of the feed tube to regulate the rapidity of discharge of the grain or grain product into the eye of the runner.

Using the Telephone.

The Bell telephone people in this city have adopted the system of renting instruments at $50 per double pair per year for use on local lines, and decline to sell them to users. In order to prevent infringement of their patents they maintain agents whose duty it is to watch for attempts at private manufacture of the invention over certain districts, and on detecting such to require the unauthorized maker to pay the same rent as if he had regularly hired his instrument. This method of managing a patent is rarely successful. The apparatus may be constructed very easily, and at the cost of only a few cents; it is so much a novelty that hundreds will make it, if only to gratify their curiosity, while others having found uses for it will go on and employ it as freely as they would the telegraph. No system of espionage can take account of all such cases, and therefore it probably would be found much more remunerative if the invention were manufactured and sold at a fair profit. This is already done in Germany, a correspondent writes us, where Professor Bell has no patents, and where a pair of instruments can be purchased for six dollars. In England the price demanded is $150, which is obviously excessive. Patentees and patent proprietors make a mistake in endeavoring to gain larger profits by guarding their devices thus closely. There is more to be gained by allowing them to come into the widest possible usage, and by the exercise of reasonable liberality.

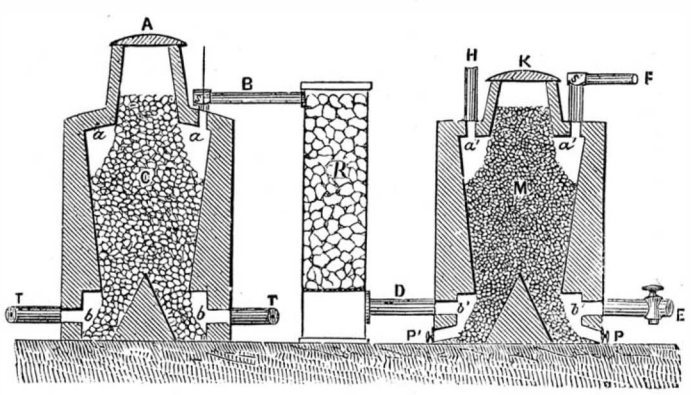

Fig. 1.—M. HENRI GIFFARD'S APPARATUS FOR THE MANUFACTURE OF HYDROGEN IN THE DRY WAY.

Novel Method of Indicating Perspiration.

M. Aubert, the author, has studied the effects of cutaneous disease in modifying the perspiratory secretion. He made use of the following simple procedure: A piece of white paper is applied to the skin, and maintained in contact a few minutes. The sweat, as it issues from the follicles, slightly moistens the paper at points corresponding to their orifices.

A dilute solution of nitrate of silver is then brushed over the paper, and the nitrate becomes converted into a chloride from the chloride of sodium in the perspiration. The chloride of silver blackens upon exposure to light, in this way mapping out the distribution, etc., of the sweat glands. With the aid of this test paper he has studied the secretions in nævus, ichthyosis, pelade, erysipelas, scabies, lupus, favus, herpes, psoriasis, etc.

Aubert's observations enable him to state that, as a rule, irritations of the skin completely suppress the perspiratory secretion, and that after their disappearance some time elapses before the secretion reappears. In cicatrices many of the glands disappear, but those which remain secrete more profusely than before.—*Le Progrès Medical.*

It is announced that Mr. J. W. Ward, of Belfast, has accomplished the feat of observing the satellite of Neptune with a 4½ inch achromatic.

M. HENRI GIFFARD'S NEW APPARATUS FOR THE PRODUCTION OF HYDROGEN IN LARGE QUANTITIES.

Hydrogen is the lightest of known gases. Air outweighs it fourteen and a half times. Hence it is the most favorable gas that can be employed for the inflation of balloons. Illuminating gas is commonly substituted for hydrogen for this purpose, but simply on the score of convenience, due to the readiness with which it may be obtained. The ascensional force of hydrogen is in the proportion of 1,100 to 700 as compared with that of illuminating gas, hence the economical production of the former for aeronautical purposes as well as for industrial uses is greatly to be desired.

A novel apparatus which, according to *La Nature*, solves this problem has lately been devised by M. Henri Giffard, the well known inventor of the Giffard injector. Two devices are proposed, the first working in the dry and the second in the wet way.

The first apparatus is based on two well known chemical reactions, namely, (1) the reduction by carbonic oxide of natural oxide of iron, and (2) the decomposition of vapor of water by metallic iron reduced in the preceding reaction. The system is composed essentially (Fig. 1) of two cylindrical furnaces, C and M. The first is filled with coke, and the second with fragments of natural iron oxide (ore). These furnaces are built of fire brick. Inside are formed recessed portions, so disposed that the coke or ore may be surrounded above and below by annular spaces, *a a*, *b b*, *a' a'*, and *b' b'*, which are always clear, and never choked by the material introduced at A and K. The ore furnace has doors at P P', through which the lower portion of the ore is agitated in case of obstruction.

The coke in chamber, C, is ignited from beneath, and air is blown in through the tweers, T T', causing energetic combustion. The carbonic oxide formed escapes at the annular space, *a a*, passes into the tube, B, and traverses the cylinder, R, which is filled with broken refractory material and wherein the cinders are deposited. The gas is then led by the conduit, D, to the lower part of the ore furnace, M, which it enters by the annular space, *b' b'*, and leaves by the space, *a' a'*. The oxide of iron is reduced and its surface transformed into metallic iron. The gas itself is converted into carbonic acid and escapes by the tube, F, communicating with a chimney. No grate or fire is necessary in the second furnace, as the carbonic oxide is itself hot enough to raise the temperature of the ore to the desired degree.

When the reduction of the ore is effected a current of steam is sent through the mass. The reduced metallic iron combines with the oxygen of the water and the hydrogen is disengaged. To this end the valves, *s'* and *s*, are closed and the steam is introduced by the tube, E. The hydrogen escapes by the tube, H, traverses a powerful refrigerant, and is finally dried in a lime purifier. After this decomposition of the water the iron is oxidized anew. Carbonic oxide is again passed through it, the ore is again reduced, steam is admitted, and thus the operation goes on indefinitely.

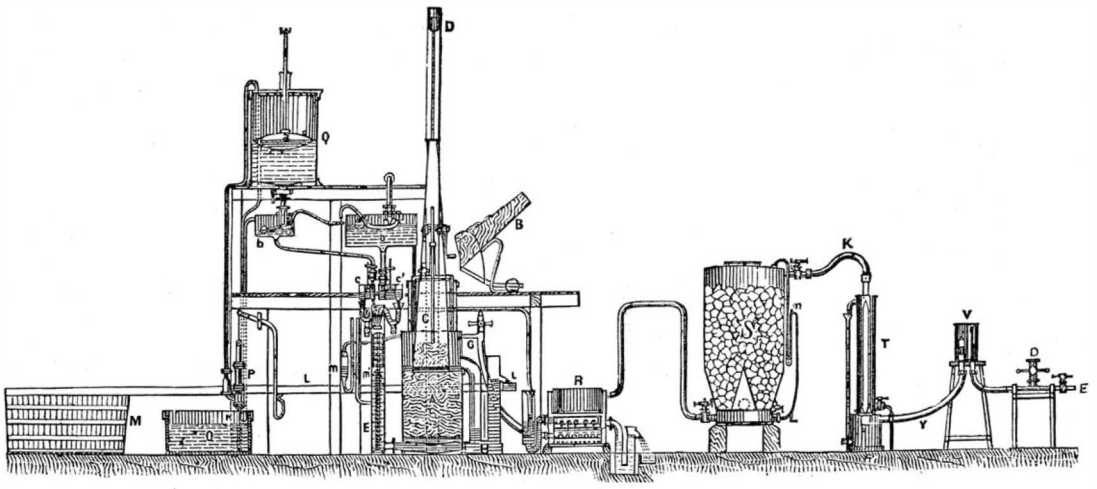

Fig. 2.—APPARATUS FOR THE MANUFACTURE OF HYDROGEN IN THE MOIST WAY.

The following details of actual experimenting with the apparatus are given: In order to produce 32·7 cubic feet of hydrogen there is required theoretically 12,320 grains of water, or say, in practice, allowing for loss 2·2 lbs. The formation of the last amount of steam costs, in Paris, one tenth of a cent's worth of combustible, counting coal at $6 or coke at $8 per ton. This steam, before use, is employed to drive the blower, so that it yields free a certain amount of motive power which should be credited. In order, moreover, to produce 32·7 feet of hydrogen, 8,878 grains of pure carbon are needed to generate (theoretically) the necessary carbonic oxide, or practically about 9,240 grains. To allow for loss, let these figures be increased to 12,320 grains. This amount of coke costing 0·62 of a cent, 32·7 cubic feet of hydrogen costs, in Paris, 0·67 of a cent. Add to this the insignificant cost of ore reduced to powder, etc., and the total maximum cost may reach 1 cent per same amount, or, say, 30 cents per 1,000 feet.

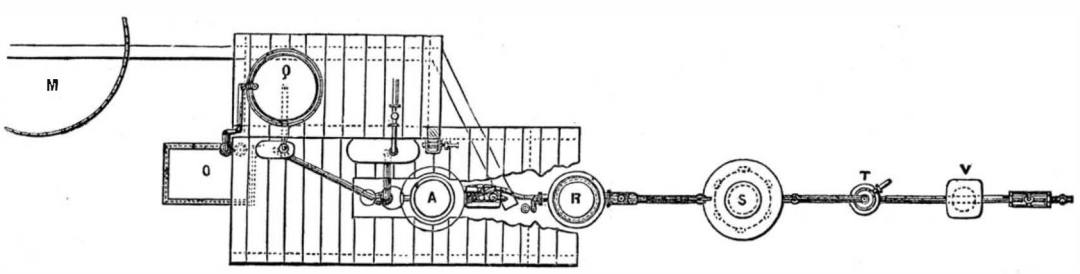

Fig. 3.—PLAN OF APPARATUS, FIG. 2.

M. Giffard's second or wet-way apparatus is no less ingenious than the foregoing. In Fig. 2 the generator, A, is the essential portion in which the hydrogen is made. Iron turnings are introduced by the swinging inclined plane, B. They fall into the large conduit, C, which is disposed like the mouth of a blast furnace and which is hermetically closed by a hydraulic arrangement lifted at the moment of filling by a cord passing over the pulley, D, Fig. 4. The iron turnings fill the interior of the vessel, A, as far as a lower perforated plate forming a false bottom. Water mixed with sulphuric acid enters the lower

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part of vessel, A, by tube, E, rises, and attacks the iron. The hydrogen produced escapes by the tube, G. The sulphate of iron in solution runs off by the U-tube, H, and is diverted by the conduits, L L, into a large vat, M. The water as it enters raises, by its effervescence, the iron turnings, and it is said that the elements of the reaction are so constantly in such intimate contact that the production of gas, for equal weight of substances, is thirty times greater than in the ordinary apparatus. The vessel, A, is lined with thick sheets of lead.

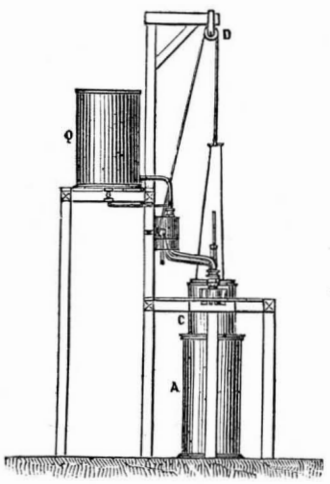


Fig. 4.—Lateral Section of Apparatus, Fig. 2.

The sulphuric acid, before being mingled with the water, is placed in a reservoir, O. A pump, P, raises it into an upper basin, Q, where a float constantly shows the level. A lower tube, having a gilded valve (so that the acid will not attack the metal), leads the acid into a tank, *b*. Water is similarly led to the tank, *b'*. Two floats automatically check the flow of the liquids when a certain level is reached. If the water supply fails, the float in the water vessel lowering, acts by a rod on the acid float and determines the closing of the supply tube for the acid, Fig. 5, so that the entire apparatus works automatically and regularly.

The acid passes from the vessel, *b*, into the vessel, *c*, and the water into *c'*. The flow may be regulated by screw valves. The vessels, *c* and *c'*, have underneath an adjutage of invariable section. By regulating the flow of the liquids in the vessels so that their level remains constant, it is rendered certain that the outflow by the lower adjutage is perfectly regular, Figs. 2 and 5. The water and acid next pass into the cylinder, E, by the U-tubes shown. In this cylinder are shelves over which the liquids fall, thus becoming intimately mingled. Finally, the diluted acid reaches the reservoir, A. At *m m'* are manometers which register the pressure in A and the frictional resistance determined by the flow of the liquid in the tube, E.

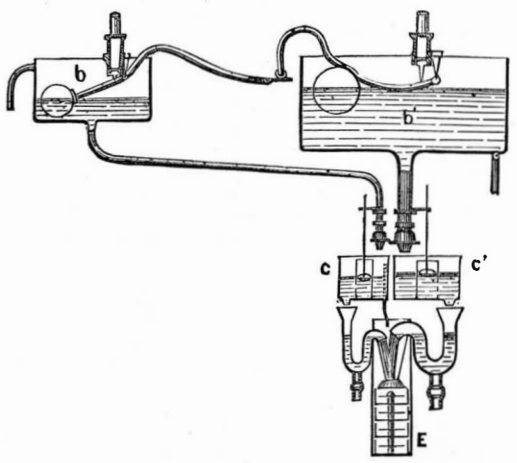


Fig. 5.—Detail of Vessels, *b* and *b'* and the Water and Acid Measurers. *c* and *c'*, Fig. 2.

The hydrogen formed escapes by G, and goes to the washer, R, thence to the dessicator, S, in which quicklime is placed and thence to the refrigerant, T, circulating in a continuous tube cooled by a current of cold water. Finally, by the pipe, Y, the gas reaches the bell glass, V, where there is a new and ingenious arrangement for measuring the supply. It consists of a large copper tube disposed vertically, and in which there is a thin lateral slit. This tube carries a hollow cylindrical valve, S, Fig. 6, which slides up and down without friction. When the gas enters the tube it lifts the valve and escapes by the lateral slit, and raises the valve the more as the disengagement is the more abundant. The height of slit opened is the direct measure of the supply. In the same vessel, V, are placed apparatus for showing the dryness, temperature and acidity of the gas. The liquid resulting from the reaction is saturated with sulphate of iron, which is allowed to crystallize and is sold. Deducting the value of this, the total cost of producing the hydrogen—which is reported to be as pure as it possibly can be made by any industrial process—is about $2 a thousand feet, or about the retail price of illuminating gas in Paris. M. Giffard intends to use the last described apparatus for the generation of the 650,000 cubic feet of hydrogen necessary for the inflation of the immense captive balloon which he proposes to exhibit at the Paris Exposition of 1878.

Fig. 6.—Detail of Vessel V, in Fig. 2.

Albuminoids in Foods.

We have already drawn attention, says the *Madras Times*, to the fact that many of the elaborate dietaries that have been drawn up, both in this country and at home, are unreliable, being based on unsound data. We pointed out that, under the method usually followed in determining the percentage of albuminoids, or flesh-formers, *i. e.*, food, it is usual to multiply the percentage of nitrogen found by 6·33, it being assumed that the whole of the nitrogen existed in the form of albuminoids. However, Professor Church, of the Royal Agricultural College, recently showed that this assumption is altogether incorrect—at any rate, as regards many vegetable productions, much of the nitrogen found being in the form of salts that possess no food value. Hence the albuminoids, in analyses calculated by the old method, are stated too high. As the percentage of albuminoids found in a food determines the value, or otherwise, of that food, it will be seen how serious is the error brought to notice. Professor Church appears to have made further investigation, and has discovered, as the following extract shows, some very serious differences in the percentage of albuminoids of certain garden products as determined by the old and new methods. It appears that in many of these products the albuminoids are only about one half what they were supposed to be. Even in grain, the albuminoids are greatly overestimated by the old method. It must be very gratifying to Dr. Lyon and others to find that their elaborate dietaries are altogether worthless. What a use Sir Richard Temple might have made of the facts we have disclosed, had they been shown to him!

Professor Church, in addressing the Cirencester Chamber of Commerce, recently said:

"It will, perhaps, be remembered by some members present to-day, that two years ago (December 5, 1875), in my annual report to this Chamber, I touched upon some experiments which had been carried out in my laboratory in order to ascertain the true feeding value of roots. These results were sufficiently startling, but they have since been amply confirmed by German chemists. The chief conclusion which must be drawn from them is this—that the flesh-forming values of many roots, and even of some other vegetable products, has been hitherto greatly overestimated by the ordinary process of analysis. The subject cannot be adequately discussed on the present occasion, but the annexed table will convey some notice of the differences between the old and new results:

Percentage of flesh-formers (albuminoids) in various farm and garden products, according to

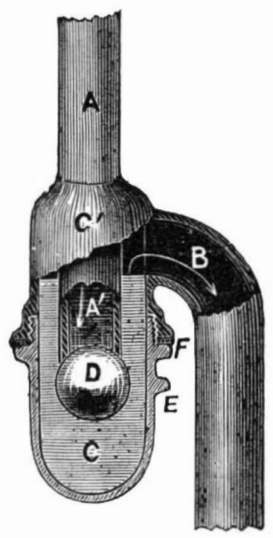
	New Method.	Old Method.
Potatoes	·95	1·83
Carrots	·55	·98
Lettuce	·71	1·53
Orange globe mangels	·48	·90
Cattle beet	·63	1·42
Yellow globe mangels	·59	1·33
Golden tankard mangels	·57	1·51
Long red mangels	·51	1·08
Pearl barley	5·73	6·22
Haricot beans	18·72	22·47

The New Coffee.

We understand that persons interested in the extension of Liberian coffee cultivation contemplate sending out supplies of seed to the different coffee-growing countries, but from what we can learn there is only disappointment in store for them. Liberian coffee can be easily raised from seed at its place of growth, but its culture from imported seed experience has proved to be very precarious, only a small percentage of the seed germinating as a general rule. Mr. William Bull, of Chelsea, who has done much to bring this new and promising variety of coffee into notice, informs us that he has examined thousands of seeds on their arrival from the west coast of Africa, but he found that their embryos had perished. To the botanical student this may perhaps appear a curious fact, but it is not to be disregarded by those who are engaged in coffee planting. The *Coffea Liberica* is so robust, prolific, and altogether so important from a commercial point of view that it would be a pity if its cultivation were retarded by fruitless attempts to raise it from seed. Undoubtedly its introduction is likely to prove most successful where the young seedling plants are imported, and their transmission can be safely effected in plant cases specially designed for the purpose. Mr. Bull's case is employed with success. The plants are kept in boxes and pots, which are fixed in the cases with battens, so that when they arrive at their destination they can be taken out from the cases and transplanted without receiving any check. By this means the Liberian coffee has been sent in large quantities to the East Indies, Brazils, Java, etc., and in Ceylon alone thousands of acres will shortly be under cultivation. Favorable reports have been received from most places where its experimental culture has been started, and its vigorous, hardy nature enables it to grow and fructify where the more delicate species, the *Coffea Arabica*, would infallibly succumb. Whole tracts of land will, in various countries, now become valuable for coffee growing which have hitherto been unsuitable for the purpose, and, in short, the new product bids fair to revolutionize that industry. Writing from Dominica, Dr. Imray says, "If the cultivation of Liberian coffee is gradually taken up here, as I think it will be, there is a future for this little country. There are thousands of acres of splendid coffee land that might be cultivated in this island with no fear of the 'white fly' before the eyes of the planter for the Liberian tree bids defiance to its attacks. Indeed, there is a very eligible field for settlers here, with a little money in their pockets, who wish to cultivate coffee." And these remarks apply to many other parts of the world where coffee growing as an industry is either neglected altogether or in an embryonic stage of existence.—*British Trade Journal.*

PREVENTION OF GASEOUS EMANATIONS FROM DRAINS AND SEWERS.

Although our bookshelves contain a goodly number of volumes written upon the subject of ventilation, drainage, sanitary laws, and similar important questions, it is nevertheless a fact that the community at large have very crude ideas in regard to them. Hence we too often find imperfect arrangements and defective apparatus in use in houses even of the better class, while among persons of the lower class we too often find that the most stringent municipal laws are necessary to compel people to observe the most obvious rules of decency and hygiene. The injury arising from gaseous emanations from drains and sewers is a subject that should receive more general attention, and one to which sanitary engineers and others should devote studious investigation. There are those who endeavor to counteract the evil by the practical application of simple but effective appliances. Any device that proves to be efficient in preventing the escape of sewer gases should receive the attention it merits from all city officials, as well as from private citizens, on account of its importance in conducing to the health of our cities and towns. The device represented here is both simple and effective as a sewer gas trap. The ordinary S trap and other water seal traps have imperfections in operation which do not occur with the one shown here. It is constructed by Messrs. B. P. Bower & Co., of Nos. 104 and 106 St. Clair St., Cleveland, Ohio, and from the following description and annexed sectional drawing its distinctive features will be readily understood:



The inlet pipe of the trap descends about half way down into the cup-shaped chamber, C, which forms the water seal, the shape of which chamber is such as to render it scarcely possible for it to be emptied by siphonage. The chief peculiarity of the invention, however, is a floating valve, a hollow rubber ball, which, while it permits of the discharge of the waste waters from the closet, sink, etc., thereupon at once seats itself, in virtue of its buoyancy and the impossibility of its finding any other position of equilibrium, against the opening of the inlet pipe, A A', which may be connected with washstand or other fixture. B is an outlet connecting with sewer; C is a cup-shaped chamber filled with water and referred to above; D, a floating valve; E, lug for unscrewing cup; F, rubber flanges.

The utility of this simple device and its superiority to the simple water seal are obvious, for the greater the back pressure brought to bear upon the trap from any cause, the more firmly will the ball valve be pressed against, and the more firmly will it close the only opening through which the sewer gases can enter the house. The passage of sewer gas through the water seal, by absorption and emission, is likewise checked by the valve, which cuts off all communication between the water seal on the sewer side and that on the house side, in the inlet pipe above the ball. While the water in the chamber, C, next the sewer, may charge itself with the gaseous exhalations, that in A' remains unaffected.

In addition, the following incidental advantages are claimed for this device: That from the shape and position of chamber, C, it cannot be emptied and unsealed by siphonage; that it cannot become unsealed by evaporation, since the only free surface of the seal is on the sewer side, which is already fully saturated with moisture; that from the scouring action of the ball, during discharge, the trap cannot become choked with sediment; that the trap is not liable to burst by freezing, since the compressibility of the ball valve allows for the expansion during freezing; the lower section of the water chamber is a glass vessel, so that the operation and condition of the apparatus may be inspected without difficulty.

To secure the full benefit of the scouring qualities of the trap, the makers state that it should properly be put in with a free waste, and that there should not be another trap between it and the sewer, unless ventilated between them. They give preference to the "Jennings" closet (or one similar in construction), in which a solid, weighted plunger is used to close the main discharge, the trap in this case being connected to an independent overflow.

ADVICES from Pittsburgh show that nails have recently advanced in price; but it is not stated whether or not this is due to an expected enactment of a law by Congress making each tenpenny nail a legal tender in lieu of the silver dime.

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Alizarine.

The remarkable and increasing prominence which carbon printing is daily attaining is shown by the continual flow of communications upon its various phases to which our pages bear constant witness. It is well known that when, as in its original form, carbon alone was used as the coloring addition to the gelatine, the finished prints possessed an unpleasant greenish tint, which was soon found to be undesirable and unpopular, and many substances have since been used either to supplant the carbon or to ameliorate its tone when added to it in the tissue. Various pigments have been employed—some of such a nature as seriously to mar for a time the reputation for permanency through the fugitiveness of their color. Among these have been aniline dyes and cochineal colors—most of the former, it is well known, being highly fugitive, and the latter only a few degrees less so. But, as Mr. Johnson's patent specification and Dr. van Monckhoven's letter will show, another agent has been the subject of experiment, and is likely to occupy a prominent position among the pigments used for making tissue. The substance we allude to is alizarine, which promises to be one of vast importance in the new photography, as we may call carbon printing, and has of late years become one of the most interesting of products known to chemists of the present day.

For a long time madder has been known as a substance (of vegetable origin) capable of giving dyes of great value, owing to their beauty and permanency. The various chemical principles it contained were long the subject of investigation by chemists, and their researches resulted in the isolation of several compounds new to science, chief of which were alizarine and purpurine. Madder was employed for various shades of reds and purples, and one of the chief difficulties of the dyer was the preservation of the beauty and brilliancy of the tints he obtained—Turkey red being a conspicuous example of difficulties overcome, originally by means of a most protracted series of operations, which more lately, however, have been much simplified. Upon the isolation of the principles named a fresh impetus was given to dyeing with madder, tints still more beautiful being obtained.

The extraction of alizarine in a state of purity was a work of considerable difficulty—so much so, indeed, that for some time the actual formula representing its composition was matter of discussion; but a very few years ago it was solved in a manner which alone is a trophy of the scientific thought of this century. The investigations connected with the synthesis and analysis of its allied compounds resulted, by the aid of a bold conception, in the production for the first time in the history of chemistry of a vegetable coloring matter by artificial means.

Briefly it was as follows: There is a class of compounds known as "quinones," and in investigating them Graebe, a German chemist, ascertained the composition of a body not unlike alizarine which had been known for some years. It was derived from naphthaline, and by heating with zinc dust naphthaline was reproduced from it. From various analogies he was led to heat madder alizarine, and this was converted into a well known substance called "anthracene," which is usually obtained from coal tar. Drawing the inference that the relationship between these compounds pointed to the probability of the similar treatment of anthracene leading to the production of alizarine, he tried the process, with the result of obtaining from a gas tar product the colored principle, one of the most valuable dye stuffs. In the process bromine was employed, and the new product was in consequence too dear to compete effectively with the old one; but very shortly a means of substituting sulphuric acid in place of bromine was discovered, and now the manufacture is one of the most important of the day among dye manufacturers. Already it has caused the importation of madder to be most materially reduced, with the necessary consequence of a reduction in the price.

This artificial alizarine, as supplied to the dyer and printer, is not pure, and its color with alumina salts is redder than madder colors, owing, it has been said, to the presence of purpurine; but this is evidently an error, as Dr. Schunk has proved.

The exact shade it is capable of taking will be a matter of considerable importance in pigment printing, and, according to Perkins, this quality is under the control of the manufacturer to a considerable extent. For instance, alterations in the temperature cause a difference in the shades of color. Some doubt has been thrown upon the product obtained as explained above being truly identical with alizarine; but, according to the authority just named, there is no doubt as to its resemblance, seeing that to every known test it behaves in an identical manner with the alizarine extracted from the madder itself. This material, as first produced, and in a condition obtainable in commerce under the name of "alizarine," is by no means a pure product, it being contaminated with various compounds injurious to the production of the brightest colors. A method recommended by Auerbach is to dissolve the crude product in caustic soda, and then pass carbonic acid through the solution. A precipitate composed variously of alizarine and soda combined in various ways is produced. This precipitate, after being washed, is decomposed with an acid, when fine orange colored flocks are obtained, which dissolve in caustic soda with a blue tint.

When alizarine is used for dyeing Turkey red the usual process is to subject the fabric to the process of oiling, then to treat it with alumina, and, finally, the coloring matter is applied. By the new method the first and last operations are combined, the alizarine being dissolved with the aid of soap, and sulphuric acid being added to neutrality. The alizarine then separates in combination with fatty acids, very permanent and brilliant colors being produced. There would seem to be here the germs of a process which might be made use of in pigment printing by autotype; but the scope of the present article is more especially to put our readers in possession of facts relative to alizarine, so that each may, if he think fit, institute experiments on his own account.

With regard to its properties, its solubility, and its action with various reagents, the following notes will be received with interest: It can be sublimed without change, and in the anhydrous state forms prismatic crystals of shades between orange and red. With water in combination it forms gold-like crystals. It is very slightly soluble in water, even when boiling, but is soluble in alcohol and ether. It is soluble in hydrochloric acid, with a brown color in sulphuric acid, and is thrown down by water from the latter solution. In caustic soda, potassa, and ammonia it is soluble with a deep purple color, and is precipitated from these solutions by acids.

Alumina throws down the alizarine from its alcoholic solutions in the form of a beautiful red lake; and a precipitate is likewise given in solutions of alizarine in ammonia by various metallic salts—magnesium, iron, copper, silver, etc. These precipitates are known under the name of "lakes," the term being applied to precipitates of coloring matters by means of earthy or metallic oxides. It is these lakes which are of more especial interest to photographers, they, so far, being the form in which alizarine has been recommended to be employed.

There are few vegetable coloring matters which cannot be precipitated in this manner to form lakes of more or less beauty, from yellow to purple; but, fortunately, experience with all their varieties has already been obtained by painters in water color and oil, and the verdict of "fugitive" has been passed against all but the madder lakes. The beautiful crimson lake and still more beautiful carmine are prepared from cochineal, but are useless when permanency is required, as will be easily seen by referring to many an old miniature, where, in place of cherry lips and glowing carnations, we have cadaverous lines and shades of blue and green. We feel confident, however, that, in the hands of practical dyers and chemists, some compound of alizarine will be found which shall give us pigments to render our blacks as lasting as the most durable of the artist's palette. Beyond that we cannot ask more.—*British Journal of Photography.*

New Inventions.

Mr. Chester L. Crowell, of Rockdale, N. Y., has devised an ingenious form of Weighing Scale, in which the scale pan is always kept accurately in balance and any weight placed upon it conveniently read off.

Type Cases have remained much the same since the days of old Ben. Franklin, but now comes Mr. Julius Ropes, of Ishpeming, Mich., with a decided innovation, consisting mainly in making the case of circular shape and adding two pivoted covers which keep out the dust. This case is also adapted to holding other articles than type.

Mr. Theodore G. Ames, of Denton, Texas, has patented an Apparatus for Preserving Meat, etc. It is used for fumigating substances used as food, and also for impregnating water with sulphurous acid gas, for the purpose of preserving such substances by the antiseptic quality of sulphur.

Mr. Chas. H. Bear, of Manchester, York Co., Pa., has patented a Hitching Device. It is designed to hold the animal at a sufficient distance from the object to which he is hitched to prevent him from rubbing or biting the same. It consists of a stiff and strong standard having at its outer or upper end a loosely connected snap hook, and provided at its lower end with three divergent feet, or tripod support, braced and held by a circular metallic ring, and provided with a strap at the junction of its three feet which is adapted to secure the device to any immovable object, the arrangement being such as to permit the device to be attached to a ring in the pavement, a post, tree, fence, or the wheel of the vehicle.

A Lubricator, patented by Messrs. A. M. Higgins and Newton Devereux, of Manton, R. I., consists of a chamber formed at the ends of the engine slide, for receiving cotton waste or other fibrous material, and in a oil receptacle having a perforated bottom and fitted to the chamber in the slide, for supplying oil to the cotton waste. The slide is thus kept constantly lubricated and free from dirt.

Mr. Claus Raabe, of Clifton, N. Y., has invented a new and improved Self-adjusting Head Section for Couches, which forms a convenient and comfortable support for the head of a person lying upon the couch.

An improvement in Brushes, for whitewash, varnish, paint, paste and other purposes, has been patented by Messrs. Wm. B. Burtnett and George W. Cook, of New York city. In this new form of brush the bristles are confined by a metal band in such manner that they are held more firmly in place, the nails cannot be drawn from the band by swelling, and the side parts of the band act as a spring to render the brush more elastic.

A cheap and simple Fire Escape has been invented by Messrs. Geo. Lee Whaley, of Bachelor, Mo., and John K. Hassler, of Shamrock, Mo., which is claimed to be durable, always ready and not in the way.

A remarkably strong Wooden Basket, which is said to be cheaper than equivalent ones made of willow, is the invention of Mr. Jacob W. Sickler, of Tompkinsville, Pa. The novelty consists in the peculiar shape of the wood sections, connected at the upper edge by inner and outer hoops or rims, at the middle part by one or more bindings of wire, and at the bottom by a recessed stiffening disk, to which the sections are nailed.

Mr. Edward K. Burke, of New York city, has invented a Box for Books, the object of which is to furnish a receptacle for costly, rare, and beautiful books, and which is so constructed that their covers, sides and ends may be turned down into a horizontal position to enable a book to be used without being removed from the box.

A simple and inexpensive Shutter Fastener has been invented by Mr. Daniel Ward, of New York city, which operates by a coiled spring contained in a cylinder and acting upon the edge of the pivoted latch.

Mr. Thomas Donohue, of New York city, has invented an improved Coat Hanger, by which the shape of garments is not impaired, a chain of short links being attached by split rings to metallic eyes fastened at suitable distance to the inner side of the collar or band.

An improved form of Stop Cock has been invented by Messrs. Samuel M. Denniston and Charles Simmons, of Prescott, Arizona. This invention consists in a tapering tube having at its larger end a hexagonal portion for receiving a wrench, and also a flange and a threaded portion for receiving a faucet. It is adapted to both barrels and cans and is a useful little affair.

A cheap and effective compound Vehicle Spring has been invented by Mr. Eugene T. Westerfield, of New York city, the elasticity of which under light or heavy burdens is equalized, and which is not liable to break by a sudden jolt or jar.

Mr. Albert L. Lincoln, of Bethel, Vt., has invented a new and improved Expansible Horseshoe, which is designed to restore contracted horse feet to a normal condition. This is accomplished by combining with a stationary toe piece and pivoted side pieces an adjustable frog pad and spurred connecting links or braces, for expanding and contracting the shoe and with it the hoof.

Lewis W. Drake, of Hazelton, Pa., has invented an improved Coffin, which has a peculiar construction of corner pieces, the object being to give a more ornamental form and finish, together with a stronger joint of the corners with the sides and ends. The corner piece has external end beads with rectangular end grooves, the latter being between angular tongues, the whole fitting in with the end and side pieces in a secure manner.

Messrs. Marcus M. Manville and Charles A. Bissett, of Whitehall, N. Y., have invented a new form of Hose Coupling which promises well, as by its use the hose may be coupled on the ground without being raised and without interrupting the flow of water.

An improved Gate has been invented by Mr. N. B. Cooksey, of Clay City, Ill. It is so constructed as not to sag, and can be opened by a person on horseback or in a vehicle without interfering with or frightening horse or team. This gate has a high upright, which carries supporting rods from a rear post to the gate, and thus keeps the latter horizontal. To the top of the upright is attached a long arm at right angles to the line of the gate when closed, which projects over the road, and when turned opens or closes the gate, as the case may be, without the latter touching the horse or team.

Mr. Paul Symons, of Plainfield, N. J., has devised an improved Grate for Cooking and Heating Stoves, in which the grate bars are made detachable, so that any one of them, on being burned out or warped, may be replaced without necessitating the insertion of an entirely new grate.

Mr. Andrew P. Freshman, of Marissa, Ill., has invented an improved Nursery Chair, combining a stool and a child's armchair, the latter being provided with a double seat, a folding foot-rest, and a detachable guard for holding the child in the chair.

An improved Folding Table has been invented by Mr. Geo. A. Trimble, of Crown Point, N. Y., which is so constructed as to enable the loose motion of the joints to be taken up, so that it will be held firmly and securely, and at the same time is simple in construction and convenient in use. The cross bars between the legs work on wrought iron bars of quadrant shape, and by tightening thumb screws the position of the legs is fixed. The legs and cross bars are so arranged that when folded the former overlap each other, thus making the table compact.

An improved Hot Blast Oven has been invented by Mr. Jesse M. Smith, of Newark, Ohio. This oven is heated by gas, which may be obtained from the waste gases of the blast furnace or from the distillation of coal, wood, or oil, and is designed for heating air or gas for the purpose of supplying blast furnaces, Bessemer converters, heating and other furnaces. It is circular in form, with a dome-shaped top. The gas is let into a combustion chamber at the bottom by suitable valves, and the flame and products of combustion pass out through a series of horizontal flues arranged one above the other and connected at alternate ends. In passing through this zigzag course, a large heating surface is exposed and the oven soon heated. Then the gas is turned off and the cold air which is to be heated is passed through the same flues. It is proposed to use these ovens in groups of two or more, so that while air is being heated in one group the others are being brought up to the required temperature by burning gas in them.

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Business and Personal.

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Everybody their own Nickel Plater; no battery. Send 3c. stamp to Wm. Munch & Co., Groton, Tompkins Co., N. Y.

Fast Boat Engine Castings for sale. Novel cut-off, perfect valve movement, simple and effective reversing gear. Price of Castings saved in building over the link motion. Duplicate Castings of the engine in the celebrated Steam Launch Flirt, the fastest boat of her size in the world, will be furnished complete with working drawings for $25. Finished Engine, $150. Address H. S. Maxim, M.E., Room 74, Coal and Iron Exchange, N.Y.

Illustrated description of the fast Steam Launch Flirt is contained in No. 81 of the Sci. Am. Supplement.

For Sale.—One English made Lathe, 28 in. swing, 16 ft. bed, compound rest; price $150. The Bullard Machine Co., limited, 14 Dey St., N. Y.

For the best Bone Mill and Mineral Crushing Machines—five sizes, great variety of work—address Baugh & Sons, Philadelphia, Pa.

Wanted.—Second-hand Machinery to fit up Planing and Moulding Mill and Door Factory; give particulars. P. O. Box 3058, N. Y. city.

Entire right for sale very cheap. Valuable No Chimney Lamp Burner. J. Engle, Jr., Sharon Springs, N. Y.

For Solid Wrought Iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

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For book on Lubricants, R. J. Chard, 134 M. Lane, N.Y.

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For Sale.—Machinery and Compositions of all kinds of Matches. Apply to J. H., P. O. Box 942, N. Y. city.

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For a 15 in. Swing Lathe having 1⅝ in. hole through Head Spindle, something new, address Star Tool Company, Providence, R. I.

Carpenters.—Your Saws will cut straight by using my Jointer; the teeth will all be of an equal length. Sample by mail, 25 cts.; $2 per doz. E. Roth, New Oxford, Pa. I want agents.

2d Hand Iron Planer built by Smith of Salem. Plane 13 ft. x 30 in.; price $375. A. C. Stebbins, Worcester, Mass.

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Noise-Quieting Nozzles for Locomotives, Steamboats, etc. T. Shaw, 915 Ridge Ave., Philadelphia, Pa.

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Solid Emery Vulcanite Wheels—The Solid Original Emery Wheel—other kinds imitations and inferior. Caution.—Our name is stamped in full on all our best Standard Belting, Packing, and Hose. Buy that only. The best is the cheapest. New York Belting and Packing Company, 37 and 38 Park Row, N. Y.

Steel Castings from one lb. to five thousand lbs. Invaluable for strength and durability. Circulars free. Pittsburgh Steel Casting Co., Pittsburgh, Pa.

For Best Presses, Dies, and Fruit Can Tools, Bliss & Williams, cor. of Plymouth and Jay Sts., Brooklyn, N.Y.

Hydraulic Presses and Jacks, new and second hand. Lathes and Machinery for Polishing and Buffing metals. E. Lyon & Co., 470 Grand St., N. Y.

Shaw's Mercury Gauges, U. S. Standard of Pressure. 915 Ridge Ave., Philadelphia, Pa.

Improved Wood-working Machinery made by Walker Bros., 73 and 75 Laurel St., Philadelphia, Pa.

Vertical Scientific Grain Mills. A. W. Straub & Co., Phila.

Corliss Engine Builders, with Wetherill's improvements, Engineers, Machinists, Iron Founders, and Boiler Makers. Robt. Wetherill & Co., Chester, Pa.

The Niles Tool Works, Hamilton, O., have second-hand Machine Tools in first class order for sale.

Friction Clutches warranted to drive Circular Log Saws direct on the arbor; can be stopped instantly; also Upright Mill Spindles, Safety Elevators, and Hoisting Machinery. D. Frisbie & Co., New Haven, Conn.

Wanted.—Second-hand Gun Stocking, and other Gun Machinery. Address V. A. King, Lock Box 81, New Haven, Conn.

Bound Volumes of the Scientific American.—I have on hand about 200 bound volumes of the Scientific American, which I will sell (singly or together) at $1 each, to be sent by express. See advertisement on page 109. John Edwards, P. O. Box 773, N. Y.

Self-Feeding Upright Drilling Machine, of superior construction; drills holes from ⅛ to ¾ inches in diameter. Pratt & Whitney Company, Hartford, Conn.

A Rare Opportunity.—A new Factory, with Engine, Boiler, Shafting, etc.; in a splendid location; suitable for manufacturing; will be sold for less than ½ of its original cost, or will be leased on easy terms. For particulars, address L. A. Lawton, Herkimer, N. Y.

Skinner Portable Engine Improved, 2 1-2 to 10 H. P. Skinner & Wood, Erie, Pa.

More than twelve thousand crank shafts made by Chester Steel Castings Co. now running; 8 years' constant use proves them stronger and more durable than wrought iron. See advertisement, page 110.

Machine Cut Brass Gear Wheels for Models, etc. (New List.) D. Gilbert & Son., 212 Chester St., Phila., Pa.

Galvanized Iron Cornice Machines.—The most Improved, Straight and Circular. Prices reduced. Calvin Carr, Cleveland, O., and Hewes Machine Works, Newark, N. J.

Mill Stone Dressing Diamonds. Simple, effective, and durable. J. Dickinson, 64 Nassau St., N. Y.

Lansdell's Steam Siphon pumps sandy and gritty water as easily as clean. Leng & Ogden, 212 Pearl St., N.Y.

Notes & Queries

(1) J. M. S. asks: Have chemists ever analyzed the juice of the India rubber tree? What are its ingredients? A. Yes; the pure juice is essentially a mixture of a number of hydrocarbons isomeric and polymeric with turpentine oil (XC_5H_4). Consult Watt's "Dictionary of Chemistry."

(2) G. E. B. writes: What causes the needle of the compass to point north and south, electricity or magnetism? A. It is supposed to be caused by the circulation of electric currents around the earth in a direction about parallel with its equator, and the tendency of the needle to arrange itself at right angles to the direction of these currents. See also answer to S. B. G.

Shall I proceed in the same manner to make an electrotype of a wooden medallion as I would in taking one from a plaster one? A. Yes.

(3) J. N. L. asks (1) for a recipe to promote the growth of the human hair? A. The health and vigor of the hair depends in a great measure on the general vigor of the system. Brush the scalp well with a stiff brush daily (with care not to strain the hair) and wash it with pure water, to which a little cologne water or tincture of cantharides may be added. Avoid the use of pomatums, oils, etc. 2. Also, one that will cause it to cease growing? A. See answer to R. E. F.

(4) T. J. H. writes: How can I remove the rust off a nickel or silver plated surface, and make it appear as good as new? A. By buffing or polishing until a new surface is obtained, which must then be replated.

(5) A. V. P. writes: 1. Can I coat an ordinary glass jar with tinfoil? A. Yes. 2. How can I fasten it to the glass? A. With shellac varnish. Then, in order to drive off all moisture from the inside of the jar, it is well to heat the jar to about 212°, and keep it at that heat for about one hour; then seal the jar airtight, with sealing wax. 3. Can I make a plate machine by using thick window glass for the plate, cutting it 8 or 16-sided, putting a hole through the center and clasping it between wood disks on a wood shaft for turning it? A. Yes. 4. How thick should the glass be? A. Make it of crown glass $\frac{1}{8}$ of an inch thick and 12 inches in diameter, 5. Would two thicknesses do best? A. Not for a small machine. 6. Can the collecting combs be connected directly with the jars? A. Yes. See SUPPLEMENT 105, p. 1669. 7. Of what is it best to make the cushions? A. Of chamois leather, and stuffed with hair?

I would like to know my best method for procuring oxygen gas, not too expensively, for trying a few ordinary experiments; using say 2 or 3 gallons at a time? A. Make a retort out of a piece of iron gas pipe 8 inches long and of about 1 inch bore; on one end of this have a gas fitter screw on a cap airtight, and on the other end a reducer, connected airtight with about 2 feet of ¼ inch gas pipe: now it would be well to place the retort in the fire, so as to burn off any oil that may be in it; then remove it from the fire, and when it is cool place in it a mixture of about equal parts of pulverized black oxide of manganese and chlorate of potash; then heat the retort gradually, and the oxygen gas will escape at the end of the ¼ inch pipe, where it may be collected over water or by simply bending the ¼ inch pipe into a glass jar, so that the oxygen gas (which is heavier than air) may settle in the glass jar. A little splinter of ignited charcoal held near the mouth of the jar will indicate (by burning brightly) when the jar is full.

(6) E. M. asks what can be put on carpets while sweeping to lay the dust, and which will not injure the carpets? A. Wet tea leaves.

(7) In answer to J. S. H., who asks for a good recipe for vinegar made by chemicals, SUPPLEMENT 86, 326, 284, 156, and 123, vol. 37, SCIENTIFIC AMERICAN.

(8) R. E. F. asks for a safe and simple method or preparation that will permanently remove from the upper lip a slight down, which being dark is unpleasantly apparent? A. Böttger recommends the following: 1 part, by weight, pure crystallized sodium sulphydrate, and 3 parts of fine purified chalk; rub well together, moisten with water, and apply a layer the thickness of a knife blade. It should be allowed to remain in contact with the flesh not more than two or three minutes. If the materials are impure the skin may be stained.

(9) J. B. M. asks: At what degree of heat will green oak staves take fire in a light dry house without coming in contact with fire or a heated wall or iron? A. For a short time probably 600° Fah.

(10) S. B. G. writes: The magnetic needle is said to stand at right angles to a current of electricity parallel to the equator. Then what is the cause of the variation of the magnetic needle or the current of electricity? A. Perhaps you will understand this if you bear in mind that the magnetic equator does not coincide with the terrestrial. The former is a somewhat sinuous line, not differing much from a great circle inclined to the horizon at an angle of 12°, and cutting it on two points almost exactly opposite each other, one in the Atlantic and the other in the Pacific. These points appear to be gradually moving their position, and traveling from east to west.

(11) L. A. B. asks: Will a sun dial show correct time the year round? A. As regards solar time, yes; as regards mean time, no.

(12) E. R. G. asks if our common red clover seed is used in this or foreign countries for the purpose of coloring or making colors of any kind? A. We have never heard of their being used for such a purpose; and, judging from their chemical composition, we should say that they could not be.

(13) S. B. G. asks: Where will a body weigh the heavier by a spring balance at new moon—on the opposite side of the earth from the moon and sun, or at right angles to the center line of attraction, which would be at low tide? A. It would weigh heavier, of course, on the opposite side of the earth from the moon, where it is less influenced by the attraction of the latter, and in a downward direction.

(14) A. P. B. says: It is a well known fact that in some sections of our country water does not lie at the same depth, that is, a well may be sunk one hundred feet before finding water, while but at a very short distance water may be found quite near the surface. Is there any means by which these veins of water can be found or their depth determined? A. There can be no means of determining the matter, for the reason that the presence or absence of water, at different depths, depends wholly on the structure and inclination of the underlying strata—a point that can be settled by trial only

(15) C. W. K. says: In the publisher's prospectus of Wm. Cullen Bryant's "History of the United States," it states that "Geologists have demonstrated that this is the oldest of the continents." He seems inclined to doubt this, and asks our opinion. A. We believe that the most prominent scientists all concede America to be the old world, geologically speaking. From our own reading on the subject we cannot think otherwise.

(16) C. M. R. asks why paper immersed in water in absorbing the water swells, and why, if it had been immersed in oil, although it absorbs the oil, yet it does not swell. I refer particularly to linseed oil. A. The paper originally consisted of exceedingly fine fibers mixed with water in the form of a pulp, to which there was added a small quantity of glue. When it is soaked in water the latter disintegrates it and causes the fibers to separate and to again assume a semi-pulpy state; the paper can hardly be said to swell. Oils have not the property of causing such a disintegration any more than they have of dissolving certain things that are soluble in water.

(17) I. J. I. asks: What chemicals must I use to make a freezing compound? A. Any of the following will answer the purpose: Snow or powdered ice 2 parts, common salt 1 part; snow or powdered ice 3 parts, crystallized chloride of calcium 4 parts; or sulphate of soda 6 parts, nitrate of ammonia 5 parts, dilute nitric acid 4 parts. The parts referred to are by weight.

(18) G. W. K. asks: Is soda injurious as a tooth powder? A. Yes.

How can I make japan for small castings (yellow japan)? A. Gamboge, 2 drachms; cape aloes, 3 drachms; pale shellac, 4 ozs.; alcohol, 1 quart.

How can I melt gold dollars in a common blacksmith's forge? A. Gold coin may be readily melted in the heat of an ordinary blacksmith's forge. You will need a crucible, made either of graphite or French clay, in which to melt them.

(19) A. H. C. asks for a recipe for darkening the color of the hair, not instantly, but by gradual process? A. Apply occasionally as a wash the expressed juice of the bark of green walnuts (*Paulus ægimeta*).

(20) X. asks: What mineral or chemical substance would be best to deodorize the fumes of gasoline smoke? Could the fumes be precipitated or conducted through a chemical mixture and divested of the bad smell? If so, by what chemical substance? A. The trouble is due to the difficulty of securing complete combustion. The vapors may be condensed by passing through cold water, or thoroughly oxidized by conducting them through a column of granular potassium bichromate kept constantly moistened with strong sulphuric acid.

(21) L. A. asks how to cement a hard rubber triangle, such as draughtsmen use? A. Melt together equal parts of pitch and gutta percha, apply hot and press the parts firmly together until quite cold. If properly applied, the lines will be only very slightly out of true.

(22) R. W. S. asks: What can I use to cleanse and burnish my lamp burners to prevent their smoking? I have tried various preparations, all to no advantage, and am obliged to throw them aside and get new ones, which only last a few weeks, until they smoke as bad as the old ones just laid aside. A. To clean unlacquered brass work use a stiff brush, plenty of hot soapsuds, and a little fine sand; dip in clean water and touch up with tripoli. It may be kept clean for a time by applying a light coating of shellac in alcohol with a little dragon's blood to color. Lacquer may be removed by strong hot solution of borax.

(23) L. A. L. asks: 1. What is the price of aluminum in Europe? A. About $1.30 per ounce. 2. Can it be had in amounts suitable for manufacturers' use? A. Yes. 3. Where is the metal mostly prepared? A. In France. 4. Is any made in America? A. Not commercially. 5. What are the best sources of supply? A. The minerals or ores from which metallic aluminum may be economically extracted by methods in use at present are: Bauxite, found, in notable quantities, only in France—at Beaux and Revese, and cryolite, occurring in abundance on the western coast of Greenland and in the Ural Mountains, Russia. (See SCIENTIFIC AMERICAN SUPPLEMENT No. 62, p. 990.) Most of the commercial aluminum is obtained from bauxite; that from cryolite is usually impure. (See SCIENTIFIC AMERICAN SUPPLEMENT, pp. 798 and 1213, and SCIENTIFIC AMERICAN, vol. 37, p. 153.)

(24) J. K. S. writes: In the SCIENTIFIC AMERICAN, vol. 1, new series, p. 38, you give a rule for constructing cone pulleys. Will you please explain how to multiply by the angles? I have tried it and I cannot get the same answer as you give. A. The article referred to does not give rules, but merely contains a few illustrative examples, the method of solving which is not explained. You will find simple methods described in "Wrinkles and Recipes."

(25) N. O. P. writes: Does such an article exist as a bullet-proof jacket, or has there yet been invented a covering for a man's body capable of resisting the action of pistol balls? If so, where can one be purchased. If not, what substance, metallic or otherwise, best resists the penetration of leaden bullets? A. A great many patents for such garments were taken out during our late unpleasantness, and possibly you can obtain what you want from a dealer in weapons of offense and defense.

(26) R. H. M. writes. 1. I want to build a steamboat 50 feet long, 12 feet beam, to draw not over 16 inches, as the water is very shoal in places where I wish to run. She will be of fair model, but quite flat amidships. How large an engine will I need? A. An 8 x 10 will answer. 2. What pitch ought the screw to have? A. It will be better to use two screws, with a pitch of 4½ to 5 feet. 3. What will be the speed? A. About 5 or 6 miles an hour.

(27) G. W. writes: I have an engine 2 x 2½ inches; boiler, 9 square feet of heating surface, containing about two buckets of water, carrying 100 lbs. of steam and running 600 revolutions per minute. What power is developed? A. If the boiler is capable of furnishing steam for running the engine at this speed, you should realize about 1¼ effective horse power.

(28) W. R. B., query No. 20, January 19, asks for a method to clean sponges used at the Aquarium. I would suggest in addition to your information that good clean sand be tried. The mode of operation is to work the sand into the sponge by a kneading process, and when sufficiently worked rinse in warm (not hot) water, which loosens and removes the dirt and slime.—J. W. C.

(29) E. K. asks: What will take a stain of coal oil, about six feet in diameter, out of a dark Brussels carpet? A. Try heating the spot very hot before a fire for some time, to drive out the oil by evaporation. If that fails, probably wetting with purified benzine will effect the object.

(30) R. C. asks: What is the latest estimate of the zero of temperature, and upon what considerations is that estimate based? A. Assume a cylindrical tube, closed below and open above. Further assume the air in the tube is confined by a piston which has no weight and moves without friction. As the temperature rises or falls, of course our assumed piston would rise or fall in the tube, following the expanding or contracting of the confined air. Mark the point at which the piston falls at the temperature of freezing water, 0°, and the point to which it rises at the temperature of boiling water, 100°. Lastly, divide this piston into 100 equal parts, and continue the division of the same size above 100° and below 0°. It will be found that almost exactly 273 such divisions can be made before reaching the closed bottom of the tube. These divisions correspond to centigrade degrees, so that the absolute zero is 273° below the freezing point centigrade, or 459° below that of Fahrenheit.

(31) L. A. W. asks for the number of power looms in the United States and Europe? A. According to the compendium of the ninth census of the United States, issued at the Government printing office in Washington, D. C., there are in the United States 157,310 power looms used in the manufacture of cotton goods, and 1,451 in the manufacture of carpets.

(32) R. W. asks: Can an ice boat sail faster than the wind which blows it along? A. Yes. See SCIENTIFIC AMERICAN SUPPLEMENT Nos. 54 and 61, for full particulars.

(33) With regard to destroying lice on cattle and not injure them, G. B. says: Take 1 pint fish oil, pour it on the animal gradually, from the back of the horns to the root of the tail. To cure the cow itch or scratches: Paint the pastern joint well with white lead and oil; any kind of vegetable or animal oil will answer. Keep the cow haltered so she cannot lick her feet or go into water for one week. One application of each remedy is sufficient. On using the oil for lice, I have seen a cow in seven days' time shed her coat, and in 14 days' time a new beautiful coat of hair in its place; took on fat so very fast that in 30 days' time she was ready to kill for beef, and good beef at that. This in all was 30 days from the time she had been served with the dose of oil on her back. She had the prettiest coat of hair I ever saw on an animal's back. We keep our dogs well greased with tanner's oil, to kill fleas, and keep off flies in summer.

(34) A. E. K. asks: What is the salary of a first class engraver, capable of doing work similar and the same as banknote, vignette and script lettering equal to banknote work, which is got up at present in the States and Canada? A. The compensation received by first class banknote engravers varies a great deal, according to their abilities. You must apply to an engraving company, with specimens of your work, if you wish to obtain definite information.

(35) F. C. writes for directions for making a small magnetic engine, either upright or horizontal? A. You will find a fully illustrated description on p. 301, SUPPLEMENT No. 19.

(36) F. D. H. asks (1) if there is such an article as gunpowder that makes no noise when exploded in an ordinary gun? A. No. 2. In the forcible discharge of a missile from a gun barrel, will not the sound waves be produced in a greater or less degree, no matter what the explosive employed? A. Yes.

(37) S. S. B. asks: How can I make and apply ink as used on ribbons of dating stamps, etc., either purple or some other color? A. The inks are made by dissolving the soluble aniline or other coal tar dyes in hot glycerin diluted with about ⅔ its weight of water. For red, "rubine" extra or aurin with a few drops of ammonia; for blue, water blue BR, 5B, or 2B; for green, methyl green; for violet, methyl violet 5B, Hoffmann's violet 3B, or gentiana-violet B; for black, nigrosin.

(38) A. K. asks: How can I detect the presence of sulphate of soda in a solution of hyposulphite of soda? A. Heat the hyposulphite solution for some time with excess of dilute hydrochloric acid, free from chlorine, filter, add to the warm filtrate slight excess of solution of barium chloride, and after standing a short time filter. The precipitate, if any, consists of barium sulphate; 100 parts by weight (washed with hot water and dried) equal about 78 parts sulphate of soda in hyposulphite solution,

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(39) A. K. asks: What is the best temperature of water for scalding purposes (hogs, poultry, etc.)? A. From 180° to 212° Fah. is generally recommended.

Describe the method of extracting beeswax with bisulphide of carbon? A. Use a sufficient quantity of the sulphide (free from dissolved sulphur) to cover the body containing the wax; after a short time the wax will have been completely dissolved. Strain the solution into a suitable retort, provided with an ordinary condensing worm, and distill off the volatile sulphide by steam heat or hot water bath. The residue of wax should be fused to expel the last traces of the sulphide.

(40) F. de C. asks: Has any astronomer investigated or explained why planets describe ellipses and not circles around their central sun? A. Yes; Newton (*Princip.* i. 17, i. 75) demonstrated that, under the influence of an attractive force mutually urging two spherical gravitating bodies toward each other, they will each, when moving in each other's neighborhood, be deflected into an orbit concave toward the other, and describe, one about the other regarded as fixed, or both round their common center of gravity, curves whose forms are limited to those figures known in geometry by the general name of conic sections. He has shown that, in any assigned case, it will depend upon the particular circumstances of velocity, distance, and direction, which of these curves shall be described—whether an ellipse, a circle, a parabola, or a hyperbola; but one or the other it must be; and any one of any deg ee of eccentricity it may be, according to the circumstances of the case.

(41) R. M. B. asks how "Pepper's ghost" is produced? A. By the reflection on a sheet of clear glass in a dark room of an object strongly illuminated, and so placed as to be out of sight of the spectators.

(42) D. M. S. asks: Is there any power gained by taking a belt from the main shaft (on engine), on which is a 3 feet pulley, to an 8 feet band wheel (on a countershaft); then another belt from a 4 feet pulley on this countershaft to a 10 feet band wheel—this latter to be the motive power? Which is the better way, the above arrangement or to take belt direct from engine (3 feet pulley) to a 10 feet band wheel? A. The latter arrangement is preferable.

(43) B.—If your cylinder is 4 inches bore, 2¾ inch stroke, and you use a two-bladed screw, 16 inches diameter and 24 inches pitch, and carry a high pressure, you can run a 21 feet boat at about 7 miles per hour.

(44) W. R. inquires: 1. Why is the slide to which a locomotive engine reverse lever clutches or fastens made with irregular notches, that is, why is the reverse lever not always thrown clear over? A. The object of the intermediate notches is to allow the link to be placed in such a position that the steam can be worked expansively. 2. Is there any other reversing device than the link motion considered perfect? A. There are other arrangements for reversing, but there are no serious objections to the link motion when well designed.

(45) G. W. K. writes: I have a 30-inch corn burr which runs from 300 to 400 revolutions per minute. I am troubled with corn coming out at the top of the eye of the stone. The eye is 7 inches in diameter, feeding with a shoe; corn led well down into the stone by a 4 inch tin tube. What is the matter? A. From your account we imagine that you feed too fast or allow the stones to become too dull.

(46) C. H. writes: If a bullet be shot upward in the air from a rifle or other gun, will the bullet when it returns to the point from whence it was shot have as much force or velocity as it had when shot from the gun? A. No.

(47) E. & S. write: What is a horse power? We understand the rules for calculating the horse power of engines, use the 33,000 lbs., etc., but do not understand from what the latter is derived? A. The number 33,000 represents the number of lbs. that could be raised 1 foot high in a minute by a good horse in the time of James Watt, according to his observation. It is more than a horse does, on an average, in regular daily work.

(48) J. A. O. asks: Will two inter-friction pulleys run and do good work when of different size—say one 3 feet and the other 9 feet? A. Plain friction pulleys arranged in this manner are not very efficient.

(49) I. B. M. writes: What do you think of the practicability of supplying a 2 x 4 inch cylinder, with 75 lbs. of steam, with a boiler constructed by coiling a 2 inch iron pipe spirally with an outside diameter of 1½ feet and a height of 2½ feet? I propose also enveloping it in $\frac{1}{16}$ inch sheet iron, outside of which will be a perpendicular pipe connecting the ends of the coil and also the middle. In this perpendicular pipe I propose placing my injector, as I presume the downward current to be naturally in this pipe. The fire is to be built in the center of the coil and in direct contact with it. Of course the water will have to be right above the fire surface, and a steam dome surmounting the whole will undoubtedly be necessary. A. The weak point about this boiler would probably be the casing, which might require frequent renewal if the boiler were forced. With a steam dome arranged for superheating, your boiler will not differ materially from some that are in use at present.

(50) H. & T. write: Referring to the answer in your number of January 12, about arching boilers completely with brick, will not the soot accumulate over the top of the boiler and burn off, and thus injure the quality of the iron, especially if soft coal is burned? A. We have not heard of such a thing happening, and do not believe it likely to happen. In the mounting of stationary boilers, whether upright or horizontal, the principle of distributing the heat from the furnace so that the boiler is almost entirely surrounded by an atmosphere of heat, will, if judiciously carried out, give good results, both as regards economy of fuel, production of dry steam, and durability of the boiler, as compared with boilers mounted in such a manner that only a portion of their surface is acted upon by heat. In any style of boiler mounting arrangement should of course be made for convenience of inspection as required by law, and by a proper arrangement of doors it will be easy to prevent accumulations of soot or ashes.

(51) C. S. B. asks (1) whether a steam siphon pump will operate by the use of compressed air, the same as steam, and draw air through the suction pipes in the place of water? A. Yes. 2. Would funnel shaped suction pipes be the best for air? A. Yes.

(52) T. R. C. writes: The driving wheel on an engine is belted to a pulley 6 feet diameter on a shaft, and another pulley 5 feet diameter on the same shaft is belted to the machine. If I use pulleys half as large and run them twice as fast, can I use a smaller shaft? A. Yes.

(53) H. S. S. asks: If a cannon loaded with a charge that will expel a ball at the rate of 60 miles per hour is placed on a train running at 60 miles per hour, and discharged in the opposite direction, will the gun leave the ball and the ball drop to the ground, or at what speed will the ball leave the gun, and how far will it go from the spot where it is fired from? I claim the powder simply stops the momentum of the ball and the gun runs away from it, and the ball will drop. Some say that the ball will part with the gun at the rate of 120 miles. A. See p. 273, vol. 32, SCIENTIFIC AMERICAN.

(54) C. B. asks: What is the best method of burning coal slack or screenings for fuel? A. Use grate bars with narrow openings, and have a strong draught.

(55) T. F. W. asks: 1. What kind of barometers are used to record automatically? A. Mercurial, generally. 2. How is the recording effected? A. The general idea is to have a chart moved regularly by clockwork, on which a pen or pencil connected with the mercurial column traces a line in accordance with the variation in height.

What can be depended upon to stick labels onto glass test tubes permanently? The label can go clear around the tubes and lap sufficiently to stick to itself. A. A mucilage of gum tragacanth answers very well.

(56) J. D. B. asks: Are there any books on starch manufacturing? A. Consult Wagner's "Chemical Technology," Muspratt's "New Chemistry," Johnson's and Appleton's "New Cyclopedia," Patent Office Reports.

(57) J. E. B., in answer to A. H. S., sends the following on making printers' rollers, which he states has given good results: Take of best glue any known quantity, say 1 lb.; soak from 12 to 24 hours in cold water until the whole is fully swollen, then weigh it and add as much heavy glycerin as the glue has absorbed water; then dissolve in a water bath and evaporate all the water the glue absorbed, which can be told by weighing. I clean my roller with spirits of turpentine.

(58) G. P. says: I would like to know which is the cheapest to burn in my boiler, pine wood at three dollars a cord, or hard coal at six dollars a ton? A. The wood, at the price named, is a little the cheapest. One ton of anthracite is considered equal to 1·75 cord of pine wood.

(59) W. S. O. B. writes: 1. If the magnetism of an electro-magnet is contained in the core, I would like you to explain how the electricity affects the core when it is first covered with paper, and then wrapped with insulated wire. As the electricity cannot escape through insulated wire, I fail to see how it comes in contact with the core. A. It is an effect called induction, which is not thoroughly understood, but is nevertheless caused by the continuous passage of currents of electricity through a conductor in the neighborhood of, but insulated from, the iron core. 2. Take a core 2 inches long, ¼ inch in diameter, and wrap it with uncovered copper wire—why will it not make an electro-magnet? A. It will, but as the electric current chooses the course of least resistance, it will pass directly through the mass of copper wire, and the magnetic effect will be as if only one short piece of wire were used as a conductor. 3. What is the reason that the finer the wire used in a magnet the more resistance it has? A. It may be explained by supposing electricity to be a vibration of the molecules of a conductor.

(60) G. M. S. asks whether wrought iron drillings are of any value? A. They may be worked up as scrap iron.

(61) L. H. asks: What way of filing a circular saw will enable me to cut 2-inch pine plank into ⅛ inch strips smoothly, so as to dispense with planing afterward? A. A circular saw will not cut smoothly enough to dispense with planing if a smooth surface is required.

(62) W. W. asks: How can I black wrought iron or steel rifle barrels? A. Colored varnish is often used. For a permanent color, apply a mixture of chloride of antimony and olive oil, polish, and coat with shellac varnish.

(63) J. W. W. writes: A discussion in regard to the formation of ice having taken place, and various theories and reasons having been given, I would ask your opinion upon the subject. On the Hudson river, after the ice forms, does it increase in thickness from the bottom of the ice or from the top of the ice? A. From the bottom.

(64) D. W. P. asks: Is there any test, besides lime water, for carbonic di-oxide when mixed with oxygen or air? A. Solution of barium hydrate, when agitated in an atmosphere containing any considerable amount of carbonic acid, becomes clouded by separation of barium carbonate; blue litmus solution under similar circumstances becomes wine red. Minute quantities, as occurring in atmospheric air, are best determined by the increase in weight of absorption tubes (soda-lime or potash bulbs) by aspiration of large quantities of the dried gas.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

W. G. W.—It is nodular pyrites (iron sulphide), not meteoric.—N. A. R.—Impure kaolin.

HINTS TO CORRESPONDENTS.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries fail to appear should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them. The address of the writer should always be given.

Inquiries relating to patents, or to the patentability of inventions, assignments, etc., will not be published here. All such questions, when initials only are given, are thrown into the waste basket, as it would fill half of our paper to print them all; but we generally take pleasure in answering briefly by mail, if the writer's address is given.

WANTS AND BUSINESS INQUIRIES.

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INDEX OF INVENTIONS

FOR WHICH

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January 8, 1878,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A complete copy of any patent in the annexed list, including both the specifications and drawings, will be furnished from this office for one dollar. In ordering, please state the number and date of the patent desired, and remit to Munn & Co., 37 Park Row, New York city.

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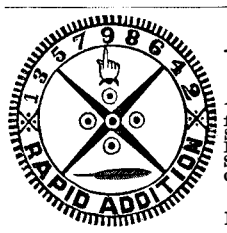

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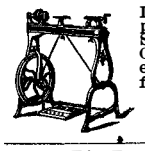

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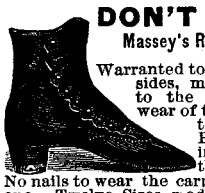

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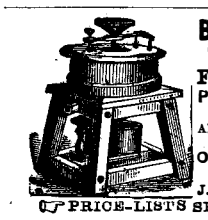

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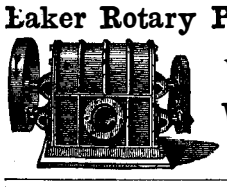

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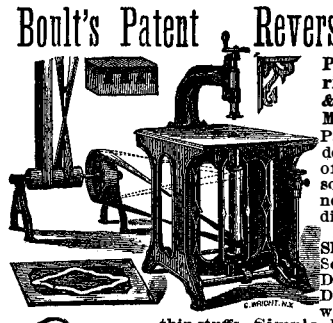

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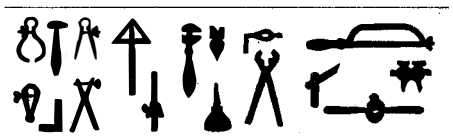

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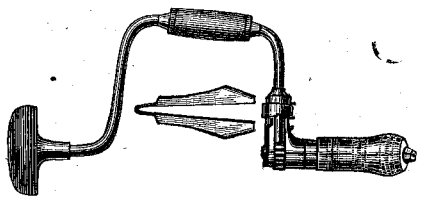

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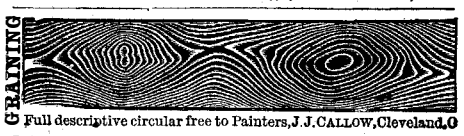

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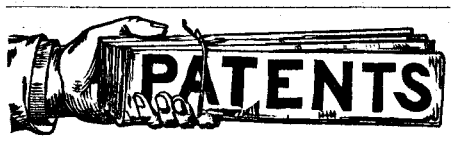

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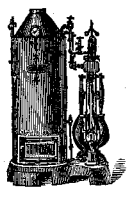

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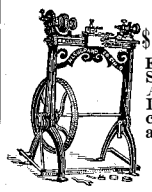

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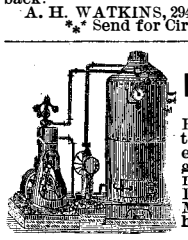

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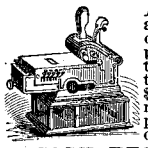

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